

NATURAL RESOURCES TECHNICAL REPORT

**Widening of SR 1002 (Aviation Parkway) from NC 54 (Chapel Hill Road) to I-40
Morrisville and Cary, Wake County, North Carolina**

**TIP U-5811
WBS Element No. 44384.1.1**



**THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Project Development and Environmental Analysis Unit
Natural Environment Section**

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to widen SR 1002 (Aviation Parkway) from NC 54 (Chapel Hill Road) to I-40 (TIP U-5811) in Morrisville and Cary, Wake County (Figure 1). The following Natural Resources Technical Report (NRTR) has been prepared to assist in the preparation of an Environmental Assessment (EA) for the proposed project.

2.0 METHODOLOGY AND QUALIFICATIONS

All work was conducted in accordance with the NCDOT Natural Environment Section standard operating procedures and July 2012 NRTR template. Field work was conducted the week of August 1, 2016. Jurisdictional areas identified in the study area were verified by Eric Alsmeyer of the U.S. Army Corps of Engineers (USACE) on November 3, 2016. Documentation of this jurisdictional determination is pending. The principal personnel contributing to this document were:

Principal

Investigator: Beth Reed, PWS
Education: B.S. Marine Biology, 1989; M.S. Coastal Zone Management, 1991
Experience: Senior Environmental Scientist, Kimley-Horn and Associates, Inc. 1992-Present
Responsibilities: Wetland and stream delineations, stream assessment, document preparation, quality assurance/quality control (QA/QC) for project deliverables

Investigator: Jason Hartshorn
Education: B.S. Environmental Technology and Management, 2011
Experience: Environmental Analyst, Kimley-Horn and Associates, Inc. 2011-Present
Responsibilities: GPS/GIS, natural community assessment, T/E species assessment/survey, document preparation

Additional personnel who contributed to portions of the fieldwork and/or documentation for this project were Ross Sullivan and William Sullivan. Appendix D lists the qualifications of these contributors.

3.0 PHYSICAL RESOURCES

The study area lies in the piedmont physiographic region of North Carolina (Figure 2). Topography in the project vicinity is comprised of gently rolling hills with level floodplains along the streams. Elevations in the study area range from 270 to 350 feet above sea level. Land use in the project vicinity consists primarily of developed commercial areas and medium to high-density residential housing interspersed with fragmented forestland around Lake Crabtree and its tributaries.

3.1 Soils

The Wake County Soil Survey identifies twenty-three soil types within the study area (Table 1).

Table 1. Soils in the study area

Soil Series	Mapping Unit	Drainage Class	Hydric Status
Altavista fine sandy loam	AfB	Moderately Well Drained	Hydric*
Augusta fine sandy loam	AuA	Somewhat Poorly Drained	Hydric*
Carbonton-Brickhaven complex, 2-6% slopes	CaB	Somewhat Poorly Drained	Nonhydric
Carbonton-Brickhaven complex, 6-10% slopes	CaC	Somewhat Poorly Drained	Nonhydric
Carbonton-Brickhaven complex, 10-15%	CaD	Somewhat Poorly Drained	Nonhydric
Chewacla sandy loam	CmA	Somewhat Poorly Drained	Hydric*
Congaree silt loam	CpA	Moderately Well Drained	Hydric*
Creedmoor sandy loam, 2-6% slopes	CrB2	Moderately Well Drained	Nonhydric
Creedmoor sandy loam, 6-10% slopes	CrC2	Moderately Well Drained	Nonhydric
Creedmoor sandy loam, 10-20% slopes	CrE	Moderately Well Drained	Nonhydric
Creedmoor silt loam, 2-6% slopes	CtB	Moderately Well Drained	Nonhydric
Creedmoor silt loam, 6-10% slopes	CtC	Moderately Well Drained	Nonhydric
Mayodan sandy loam	MfE	Well Drained	Nonhydric
Pacolet-Gullied land complex	PgF	Well Drained	Nonhydric
Pinkston sandy loam	PkF	Well Drained	Nonhydric
Warne fine sandy loam	WhA	Somewhat Poorly Drained	Hydric*
Wehadkee silt loam	WnA	Poorly Drained	Hydric
White Store sandy loam, 2-6% slopes	WsB	Moderately Well Drained	Nonhydric
White Store sandy loam, 2-6% slopes, moderately eroded	WsB2	Moderately Well Drained	Nonhydric
White Store sandy loam, 6-10% slopes	WsC	Moderately Well Drained	Nonhydric
White Store sandy loam, 6-10% slopes, moderately eroded	WsC2	Moderately Well Drained	Nonhydric
White Store sandy loam, 10-20% slopes	WsE	Moderately Well Drained	Nonhydric
Worsham sandy loam	WyA	Poorly Drained	Hydric

* - Soils which are primarily nonhydric, but which may contain hydric inclusions

3.2 Water Resources

Water resources in the study area are part of the Neuse River basin [U.S. Geological Survey (USGS) Hydrologic Unit 03020201]. Fourteen streams were identified in the study area (Table 2). The locations of the water resources are shown in Figure 3. The physical characteristics of the streams are provided in Table 3.

Table 2. Water resources in the study area

Stream Name	Map ID	NCDWR Index Number	Best Usage Classification
Crabtree Creek	Crabtree Creek	27-33-(1)	C; NSW
UT to Crabtree Creek	SA	27-33-(1)	C; NSW
UT to Crabtree Creek	SB	27-33-(1)	C; NSW
UT to Crabtree Creek	SD	27-33-(1)	C; NSW
UT to Lake Crabtree	SE	27-33-(3.5)	B; NSW
UT to Lake Crabtree	SO	27-33-(3.5)	B; NSW
UT to Crabtree Creek	SP	27-33-(1)	C; NSW
UT to Crabtree Creek	SQ	27-33-(1)	C; NSW
UT to Lake Crabtree	SR	27-33-(3.5)	B; NSW
UT to Crabtree Creek	SS	27-33-(1)	C; NSW
UT to Crabtree Creek	ST	27-33-(1)	C; NSW
UT to Crabtree Creek	SU	27-33-(1)	C; NSW
UT to Crabtree Creek	SW	27-33-(1)	C; NSW
UT to Crabtree Creek	SY	27-33-(1)	C; NSW

Table 3. Physical characteristics of water resources in the study area

Map ID	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
Crabtree Creek	8	16	24	Silt, Sand, Gravel	Moderate	Clear
SA	5	12	24	Silt, Sand	Moderate	Clear
SB	4	8	24	Silt, Sand, Gravel	Moderate	Clear
SD	2	6	6	Silt, Sand, Gravel	Slow	Slightly Turbid
SE	1	2	4	Silt, Sand, Rock	N/A	Clear
SO	1	5	12	Sand, Gravel	Slow	Slightly Turbid
SP	6	10	36	Silt, Sand, Gravel	Fast	Clear
SQ	4	7	12	Silt, Sand	Slow	Turbid
SR	1	4	6	Silt, Sand, Gravel	Moderate	Turbid
SS	4	6	N/A	Silt, Sand	N/A	N/A
ST	2	5	N/A	Silt	N/A	N/A
SU	6	8	24	Silt, Sand	Slow	Clear
SW	4	5	N/A	Silt	N/A	N/A
SY	1	2	N/A	Silt, Sand	N/A	N/A

Two open water features occur in the study area. Lake Crabtree is located in the northern half of the study area and is a jurisdictional flood control reservoir created by an impoundment of Stirrup Iron Creek, Crabtree Creek, and Brier Creek. Pond PA is located in the northern quadrant of the NC-54 and Aviation Parkway intersection and is an artificially excavated pit sustained by rainfall and groundwater with no connection to jurisdictional waters. Approximately 17 acres of Lake Crabtree and 0.8 acre of PA occur in the study area.

There are no designated Primary Nursery Areas (PNA) or anadromous fish waters in or within 1.0-mile downstream of the study area. There are no designated High Quality Waters (HQW) or water supply watersheds (WS-I or WS-II) in or within 1.0-mile downstream of the study area. No streams within the project study area, or within 1.0 mile downstream of the study area, are identified on the North Carolina 2014 Final 303(d) lists of impaired waters for sedimentation or turbidity.

Benthic samples have been taken in Crabtree Creek at NC-54 within the study area, and given a rating of “Poor” on July 5, 2000. No fish monitoring data is available for any streams in the study area or within 1.0 mile of the study area.

4.0 BIOTIC RESOURCES

4.1 Terrestrial Communities

Four terrestrial communities were identified in the study area: piedmont bottomland forest, piedmont/mountain semipermanent impoundment, pine dominated forest, and maintained/disturbed. Figure 4 shows the location and extent of these terrestrial communities in the study area. A brief description of each community type follows. Scientific names of all species identified are included in Appendix B.

4.1.1 Piedmont Bottomland Forest

The piedmont bottomland forest occurs in the study area along the floodplains of Crabtree Creek and its tributaries, as well as in portions of the forestland surrounding Lake Crabtree. Dominant overstory species in this community include willow oak, green ash, loblolly pine, northern red oak, American elm, red maple, sweetgum, and water oak. The understory and shrub layer consists of American elm, red maple, green ash, silky dogwood, tag alder, pignut hickory, and muscledwood. Herbaceous plants in this community include Japanese stilt grass, river oats, false-nettle, and smartweed. Vines observed in this community include poison ivy and greenbrier. Included in this community are floodplain depressional wetlands, which are classified as bottomland hardwood forests using the NCWAM classification.

4.1.2 Piedmont/Mountain Semipermanent Impoundment

The piedmont/mountain semipermanent impoundment community occurs in the study area in the emergent wetlands surrounding Lake Crabtree. This community lacks a true overstory. The understory and shrub layer consists of winged elm, American elm, tag

alder, sweetgum, red maple, black willow, and green ash. Sedges and cattails comprise most of the herbaceous layer present in this community. Vines observed include poison ivy and greenbrier. Included in this community are floodplain wetlands surrounding Lake Crabtree, which are classified as bottomland hardwood forests using the NCWAM classification.

4.1.3 Pine Dominated Forest

Pine dominated forests are located throughout the study area in early successional forests. The overstory in this community consists primarily of loblolly pine. The understory and shrub layer in these communities is comprised of various hardwoods, including red maple, sweetgum, white oak, northern red oak, and American beech. Herbaceous vegetation in this community is sparse and consists mostly of smartweed and various grasses. Vines observed in these forests include wild grape, greenbrier, poison ivy, trumpet creeper, and Virginia creeper. Included in this community is a portion of a floodplain wetland surrounding Lake Crabtree, which is classified as bottomland hardwood forests using the NCWAM classification.

4.1.4 Maintained/Disturbed

Maintained/disturbed areas are located throughout the study area in places where the vegetation is periodically mowed or otherwise maintained, such as roadside shoulders, parking lots, agricultural fields, and residential or commercial sites, and where existing development has limited or removed natural vegetation communities. Within the study area this community has limited canopy cover. The sapling and shrub layer consists of sweetgum, princess tree, tree-of-heaven, Chinese privet, Chinese lespedeza, red maple, crepe myrtle, and various other ornamental shrubs. Herbaceous vegetation in this community is comprised of low growing grasses and herbs including wild onion, fescue, sedge, clover, smartweed, and sheep sorrel. Vines observed within this community include poison ivy, wild grape, Japanese honeysuckle, and greenbrier.

4.1.5 Terrestrial Community Impacts

Terrestrial communities in the study area may be impacted by project construction as a result of grading and paving of portions of the study area. At this time, decisions regarding the final location and design of the proposed roadway improvements have not been made. Therefore, community data are presented in the context of total coverage of each type within the study area (Table 4). Once a final alignment and preliminary design have been determined, probable impacts to each community type will be calculated.

Table 4. Coverage of terrestrial communities in the study area

Community	Coverage (ac.)
Piedmont Bottomland Forest	64.9
Piedmont/Mountain Semipermanent Impoundment	12.1
Pine Dominated Forest	57.6
Maintained/Disturbed	280.5
Total	415.1

4.2 Terrestrial Wildlife

Terrestrial communities in the study area are comprised of both natural and disturbed habitats that may support a diversity of wildlife species (those species actually observed are indicated with *). Mammal species that commonly exploit forested habitats and stream corridors found within the study area include species such as common mouse, gray squirrel*, eastern cottontail, raccoon, North American beaver, Virginia opossum, and white-tailed deer*. Birds that commonly use forest and forest edge habitats include the red-shouldered hawk, American crow*, northern mockingbird, Carolina chickadee, turkey vulture*, and tufted titmouse. Birds that may use the open habitat or water bodies within the study area include wood duck, mallard, great blue heron, belted kingfisher, barn swallow*, and eastern kingbird*. Reptile and amphibian species that may use terrestrial communities located in the study area include the eastern ribbon snake, copperhead, green snake, black rat snake, black racer, eastern box turtle*, snapping turtle, spring peeper, bullfrog*, eastern fence lizard, and five-lined skink.

4.3 Aquatic Communities

Aquatic communities in the study area consist of perennial and intermittent piedmont streams, and a manmade reservoir. Perennial streams in the study area could support fantail darter, swallowtail shiner, bluegill, and redbreast sunfish. Intermittent streams in the study area are relatively small in size and would support aquatic communities of spring peeper, crayfish, and various macroinvertebrates. The open water communities in the study area could support largemouth bass, bluegill, redbreast sunfish, and channel catfish.

4.4 Invasive Species

Six species from the NCDOT Invasive Exotic Plant List for North Carolina were found to occur in the study area. The species identified were Chinese lespedeza (Threat), Chinese privet (Threat), Japanese stilt grass (Threat), princess tree (Threat), tree-of-heaven (Threat), and Japanese honeysuckle (Moderate Threat). NCDOT will manage invasive plant species as appropriate.

5.0 JURISDICTIONAL ISSUES

5.1 Clean Water Act Waters of the U.S.

Fourteen jurisdictional streams were identified in the study area (Table 5). The locations of the streams are shown on Figure 3. The NCDWR stream identification forms are included in Appendix C. The physical characteristics and water quality designation of the jurisdictional streams are detailed in Section 3.2. The jurisdictional streams in the study area have been designated as warm water streams for the purposes of stream mitigation.

Table 5. Jurisdictional characteristics of water resources in the study area

Map ID	Length (ft.)	Classification	Compensatory Mitigation Required	River Basin Buffer
Crabtree Creek	1,082	Perennial	Yes	Subject
SA	913	Perennial	Yes	Subject
SB	2,092	Perennial	Yes	Subject
SD	1,064	Perennial/Intermittent	Unresolved	Subject
SE	224	Intermittent	Unresolved	Subject
SO	95	Perennial	Yes	Subject
SP	1,242	Perennial	Yes	Subject
SQ	492	Intermittent	Unresolved	Not Subject
SR	136	Intermittent	Unresolved	Subject
SS	150	Intermittent	Unresolved	Not Subject
ST	376	Intermittent	Unresolved	Not Subject
SU	296	Perennial/Intermittent	Unresolved	Subject
SW	88	Intermittent	Unresolved	Not Subject
SY	421	Intermittent	Unresolved	Not Subject
Total	8,671			

Nine jurisdictional wetlands were identified within the study area (Figure 3). Wetland classification and quality rating data are presented in Table 6. All wetlands in the study area are within the Neuse River basin (USGS Hydrologic Unit 03020201). The USACE wetland delineation forms and NCDWR wetland rating forms for each site are included in Appendix C. Descriptions of the terrestrial communities at the wetland sites are presented in Section 4.1. Wetland sites WA, WN, WT, WU, WV, WW, WX, and WZ are included in the piedmont bottomland forest community. Wetland site WS is included in both the piedmont/mountain semipermanent impoundment and the pine dominated forest community types.

Table 6. Jurisdictional characteristics of wetlands in the study area

Map ID	NCWAM Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
WA	Bottomland Hardwood Forest	Riparian	69	0.8
WN	Bottomland Hardwood Forest	Riparian	36	0.02
WS	Bottomland Hardwood Forest	Riparian	89	13.3
WT	Bottomland Hardwood Forest	Riparian	59	0.4
WU	Bottomland Hardwood Forest	Riparian	55	1.7
WV	Bottomland Hardwood Forest	Riparian	59	0.9
WW	Bottomland Hardwood Forest	Riparian	66	1.3
WX	Headwater Forest	Riparian	29	0.2
WZ	Bottomland Hardwood Forest	Riparian	68	0.5
			Total	19.21

5.2 Clean Water Act Permits

The proposed project has been designated as an Environmental Assessment (EA) for the purposes of National Environmental Policy Act (NEPA) documentation. As a result, a Nationwide Permit (NWP) 23 will likely be applicable. The USACE holds the final discretion as to what permit will be required to authorize project construction. If a Section 404 permit is required, then a Section 401 Water Quality Certification (WQC) from the NCDWR will be needed.

5.3 Coastal Area Management Act Areas of Environmental Concern

Wake County is not under the jurisdiction of the Coastal Area Management Act (CAMA) and no Areas of Environmental Concern (AEC) occur in the study area.

5.4 Construction Moratoria

No construction moratoria apply to any waters within the study area.

5.5 N.C. River Basin Buffer Rules

Streamside riparian zones within the study area are protected under provisions of the Neuse River Basin Buffer Rules administered by NCDWR. Table 5 indicates which streams are subject to buffer rule protection. Potential impacts to protected stream buffers will be determined once a final alignment and design have been determined.

5.6 Rivers and Harbors Act Section 10 Navigable Waters

No waters in the study area have been designated by the USACE as Navigable Waters under Section 10 of the Rivers and Harbors Act.

5.7 Wetland and Stream Mitigation

5.7.1 Avoidance and Minimization of Impacts

The NCDOT will attempt to avoid and minimize impacts to wetlands and streams to the greatest extent practicable in choosing a preferred alternative and during project design. At this time, no final decisions have been made with regard to the location or design of the preferred alternative.

5.7.2 Compensatory Mitigation of Impacts

The NCDOT will investigate potential on-site wetland and stream mitigation opportunities once a final decision has been rendered on the location of the preferred alternative. If on-site mitigation is not feasible, mitigation will be provided by the North Carolina Department of Environmental Quality Division of Mitigation Services (DMS).

5.8 Endangered Species Act Protected Species

As of April 2, 2015, the United States Fish and Wildlife Service (USFWS) lists four federally protected species for Wake County (Table 7). A brief description of these species' habitat requirements follows, along with the Biological Conclusion rendered based on survey results in the study area. Habitat requirements for these species are based on the current best available information from referenced literature and/or USFWS.

Table 7. Federally protected species listed for Wake County

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
<i>Myotis septentrionalis</i>	Northern long-eared bat	T	Yes	MA-LAA
<i>Picoides borealis</i>	Red-cockaded woodpecker	E	No	No Effect
<i>Alasmidonta heterodon</i>	Dwarf wedgemussel	E	Yes	No Effect
<i>Rhus michauxii</i>	Michaux's sumac	E	Yes	No Effect

E – Endangered

MA-LAA – May Affect, Likely to Adversely Affect

T – Threatened

Northern Long-eared Bat

USFWS Recommended Survey Window: June 1 – August 15

Habitat Description: In North Carolina, the Northern long-eared bat (NLEB) occurs in the mountains, with scattered records in the Piedmont and coastal plain. In western North Carolina, NLEB spend winter hibernating in caves and mines. Since this species is not known to be a long-distance migrant, and caves and subterranean mines are extremely rare in eastern North Carolina, it is uncertain whether or where NLEB hibernate in eastern North Carolina. During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (typically ≥ 3 inches dbh). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat also been found, rarely, roosting in structures like barns and sheds, under eaves of buildings, behind window shutters, in bridges, and in bat houses. Foraging occurs on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

Biological Conclusion: May Affect, Likely to Adversely Affect

The USFWS has developed a programmatic biological opinion (PBO) in conjunction with the Federal Highway Administration (FHWA), the US Army Corps of Engineers (USACE), and NCDOT for the northern long-eared bat (NLEB) in eastern North Carolina. The PBO covers the entire NCDOT program in Divisions 1-8, including all NCDOT projects and activities. The programmatic determination for NLEB for the NCDOT program is May Affect, Likely to Adversely Affect. The PBO provides incidental take coverage for NLEB and will ensure compliance with Section 7 of the Endangered Species Act for five years for all NCDOT projects with a federal nexus in Divisions 1-8, which includes Wake County, where U-5811 is located. This level of incidental take is authorized from the effective date of a final listing determination through April 30, 2020.

Red-cockaded Woodpecker

USFWS Recommended Survey Window: year round; November-early March (optimal)

Habitat Description: The red-cockaded woodpecker (RCW) typically occupies open, mature stands of southern pines, particularly longleaf pine, for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting and roosting in living pine trees, aged 60 years or older, which are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Biological Conclusion: No Effect

Suitable habitat for RCW does not exist in the study area. Forests in the study area are comprised mostly of hardwoods and immature pines with a closed canopy. Therefore, a half mile survey was not conducted. A review of NCNHP records,

updated June 2016, indicates no known occurrences of this species within 1.0 mile of the study area. Due to the lack of habitat and lack of known occurrences, the biological conclusion is that the proposed project will have no effect on this species.

Dwarf Wedgemussel

USFWS Recommended Survey Window: year round

Habitat Description: In North Carolina, the dwarf wedgemussel is known from the Neuse and Tar River drainages. The mussel inhabits creek and river areas with a slow to moderate current and sand, gravel, or firm silt bottoms. Water in these areas must be well oxygenated. Stream banks in these areas are generally stable with extensive root systems holding soils in place.

Biological Conclusion: No Effect

A dwarf wedgemussel survey was conducted in the project vicinity on November 11, 2016 by RK & K. The streams potentially affected by the project are Crabtree Creek or tributaries to Crabtree Creek. All tributaries for the project flow into Crabtree Creek above Lake Crabtree or into Lake Crabtree itself. The mussel survey was conducted in Crabtree Creek from a point adjacent to Cedar Fork Park upstream to highway NC 54. At the time of the survey the stream had little flow and the substrate was dominated by unstable shifting sand. A total of 57 live Eastern Elliptios (*Elliptio complanata*) and a shell fragment of a Paper Pondshell (*Utterbackia imbecillis*) were found during the survey. The results of this survey and recent others above Lake Crabtree suggest rare freshwater mussels are not present upstream of the lake. Given the Lake Crabtree dam acting as a barrier to recolonization of rare mussels from downstream, the nearest dwarf wedgemussel record being over 20 miles away, the degraded instream habitat for Crabtree Creek in the project vicinity, and the survey results, completion of this project will have No Effect on the species.

Michaux's Sumac

USFWS Optimal Survey Window: May-October

Habitat Description: Michaux's sumac, endemic to the inner Coastal Plain and lower Piedmont, grows in sandy or rocky, open, upland woods on acidic or circumneutral, well-drained sands or sandy loam soils with low cation exchange capacities. The species is also found on sandy or submesic loamy swales and depressions in the fall line Sandhills region as well as in openings along the rim of Carolina bays; maintained railroad, roadside, power line, and utility rights-of-way; areas where forest canopies have been opened up by blowdowns and/or storm damage; small wildlife food plots; abandoned building sites; under sparse to moderately dense pine or pine/hardwood canopies; and in and along edges of other artificially maintained clearings undergoing natural succession. In the

central Piedmont, it occurs on clayey soils derived from mafic rocks. The plant is shade intolerant and, therefore, grows best where disturbance (*e.g.*, mowing, clearing, grazing, periodic fire) maintains its open habitat.

Biological Conclusion: No Effect

Suitable habitat for Michaux's sumac is present in the study area along the maintained railroad, roadside, power line, and utility right-of-ways. However, many of the areas of suitable habitat within the project study area are heavily maintained by mowing or the application of herbicides and present marginally suitable habitat. Surveys were conducted by Kimley-Horn biologists throughout areas of suitable habitat on September 8, 2016 and no individuals of Michaux's sumac were observed. A review of the NCNHP records, updated June 2016, indicates no known occurrences within 1.0 mile of the study area. Due to a lack of recorded occurrences and a lack of observed individuals in the project study area, it has been determined that the proposed project will have no effect on this species.

5.9 Bald Eagle and Golden Eagle Protection Act

Habitat for the bald eagle primarily consists of mature forest in proximity to large bodies of open water for foraging. Large dominant trees are utilized for nesting sites, typically within 1.0 mile of open water.

A desktop-GIS assessment of the project study area, as well as the area within a 1.13-mile radius (1.0 mile plus 660 feet) of the project limits, was performed in July 2016 using 2015 color aerials. One water body (Lake Crabtree) large enough or sufficiently open to be considered a potential feeding source was identified. A review of the NCNHP database, updated June 2016, revealed an active nest was observed within the study area in 2009; however, the nest was noted as inactive in 2011. No NCNHP data has been recorded since 2011. Since there is foraging habitat as well as a known occurrence within the review area, a survey of the project study area and the area within 660 feet of the project limits was conducted by Kimley-Horn biologists on September 8, 2016, and no nests or individuals were observed. Due to the lack of known occurrences in the last 5 years, and the lack of observed individuals or nests, it has been determined that the proposed project will not affect this species.

5.10 Endangered Species Act Candidate Species

As of April 2, 2015, no candidate species are listed for Wake County by the USFWS.

5.11 Essential Fish Habitat

No designated Essential Fish Habitat occurs in the study area.

6.0 REFERENCES

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Appendix A

Figures

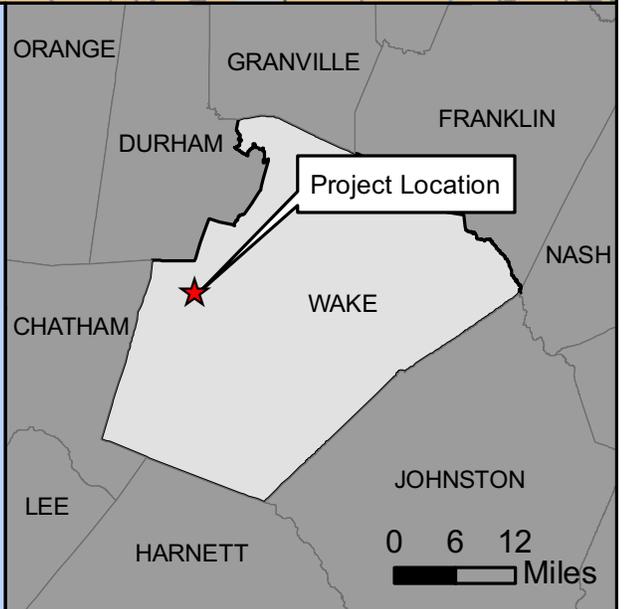
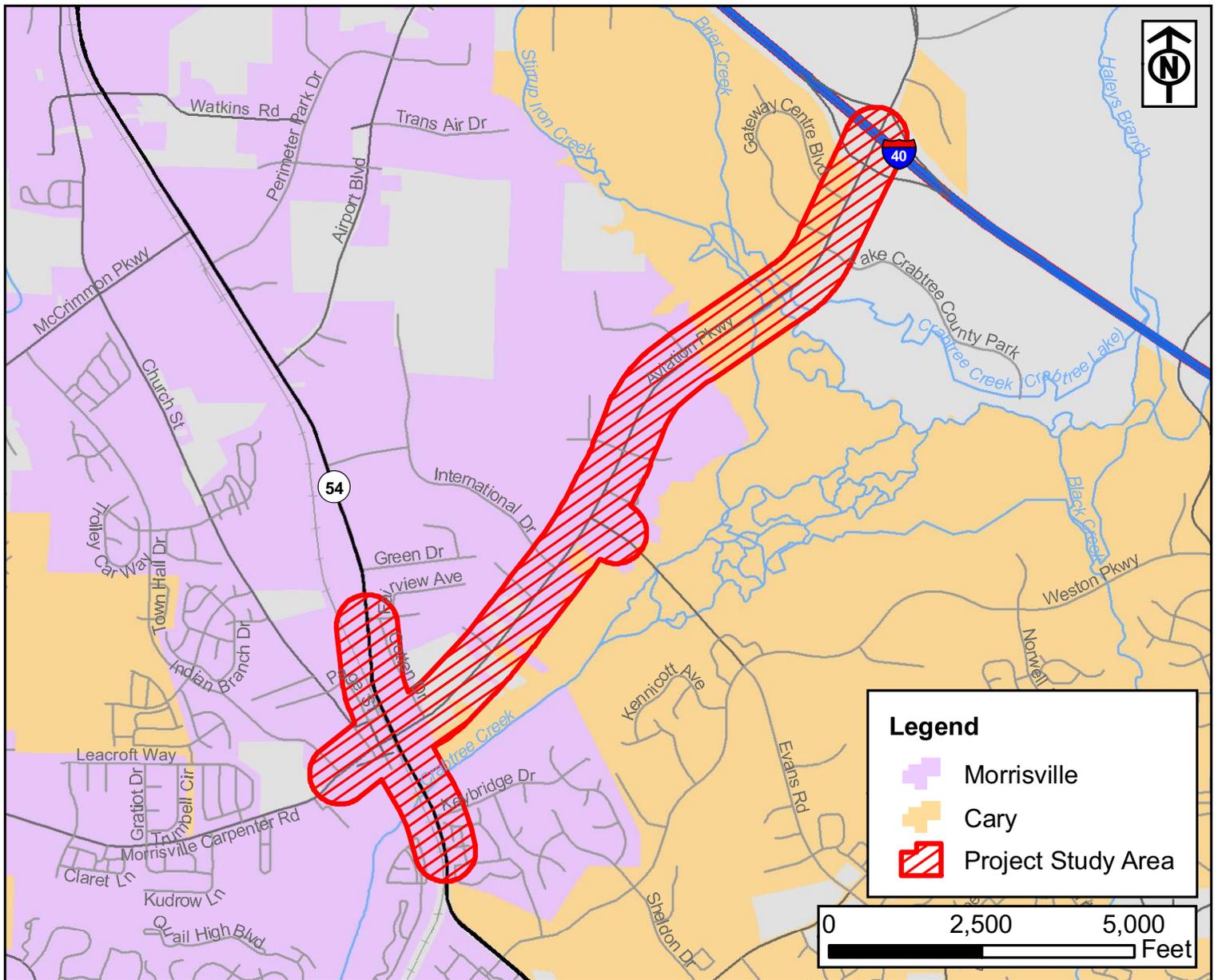


Figure 1: Vicinity Map
TIP U-5811

Widening of SR 1002 (Aviation Parkway)
Morrisville and Cary, Wake County, NC



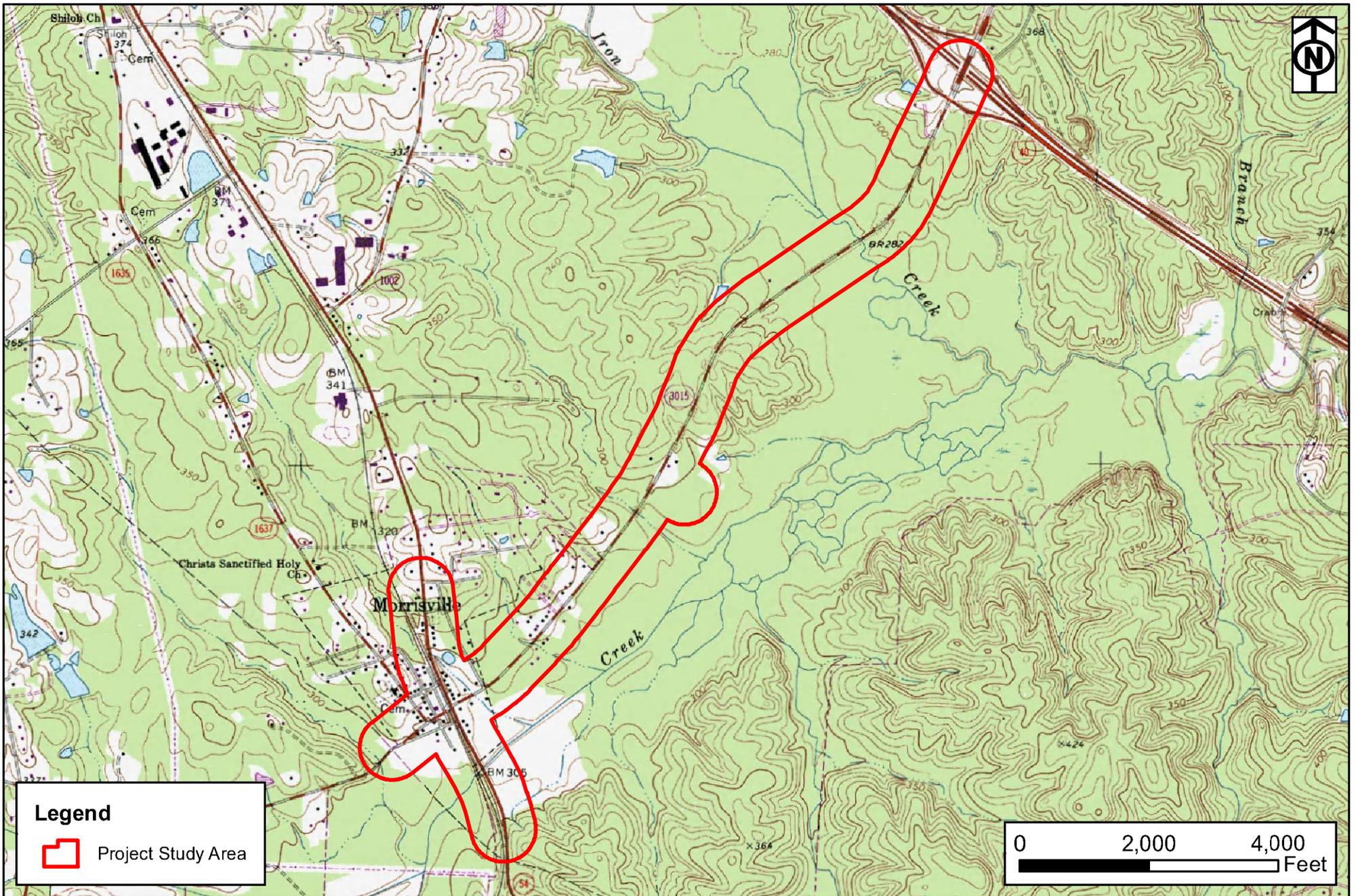


Figure 2: Project Study Area
 TIP U-5811
 Widening of SR 1002 (Aviation Parkway)
 Morrisville and Cary, Wake County, NC

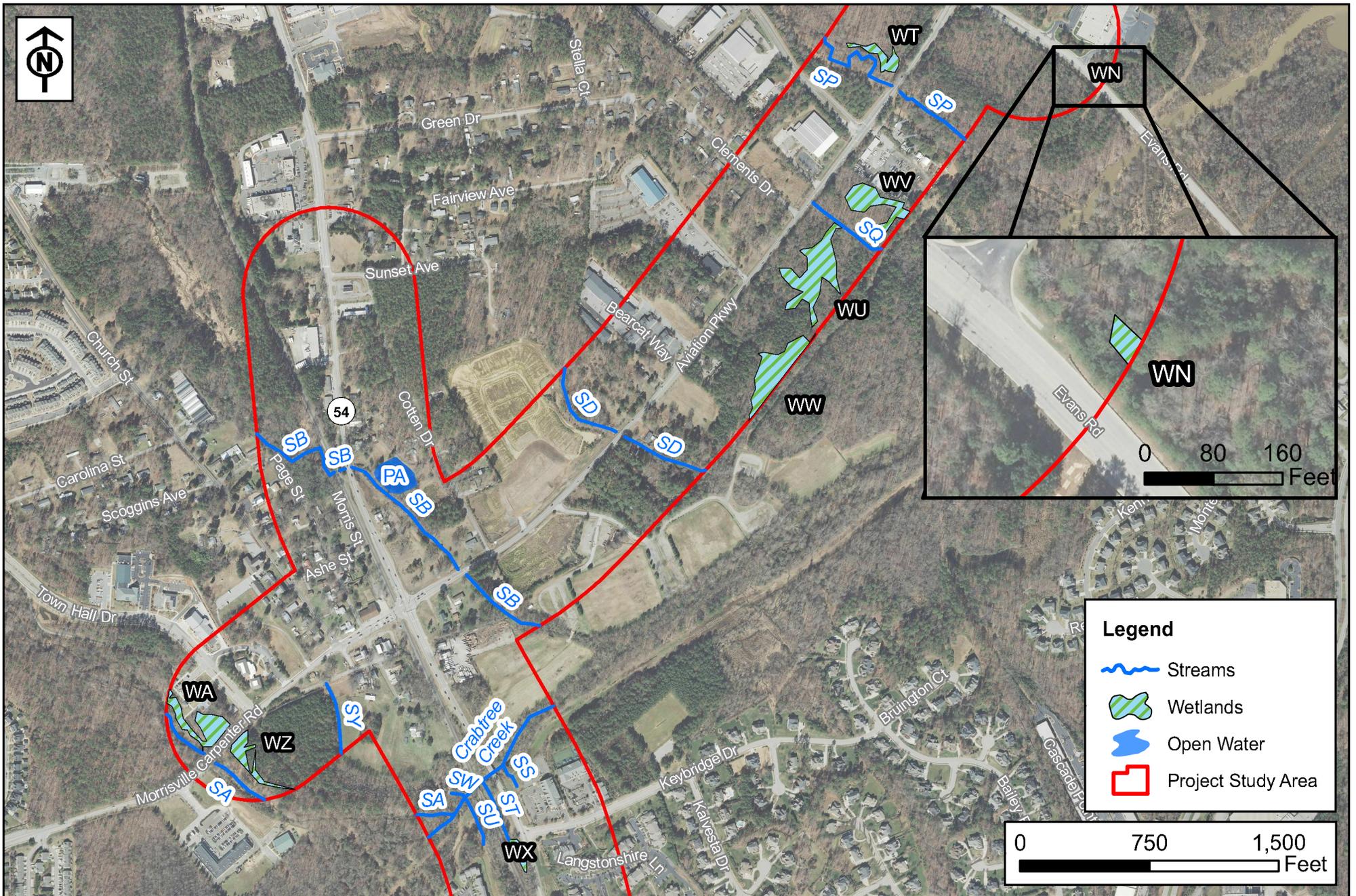


Figure 3b: Jurisdictional Features Map
 TIP U-5811
 Aviation Parkway Roadway Improvements
 Morrisville, Wake County, NC

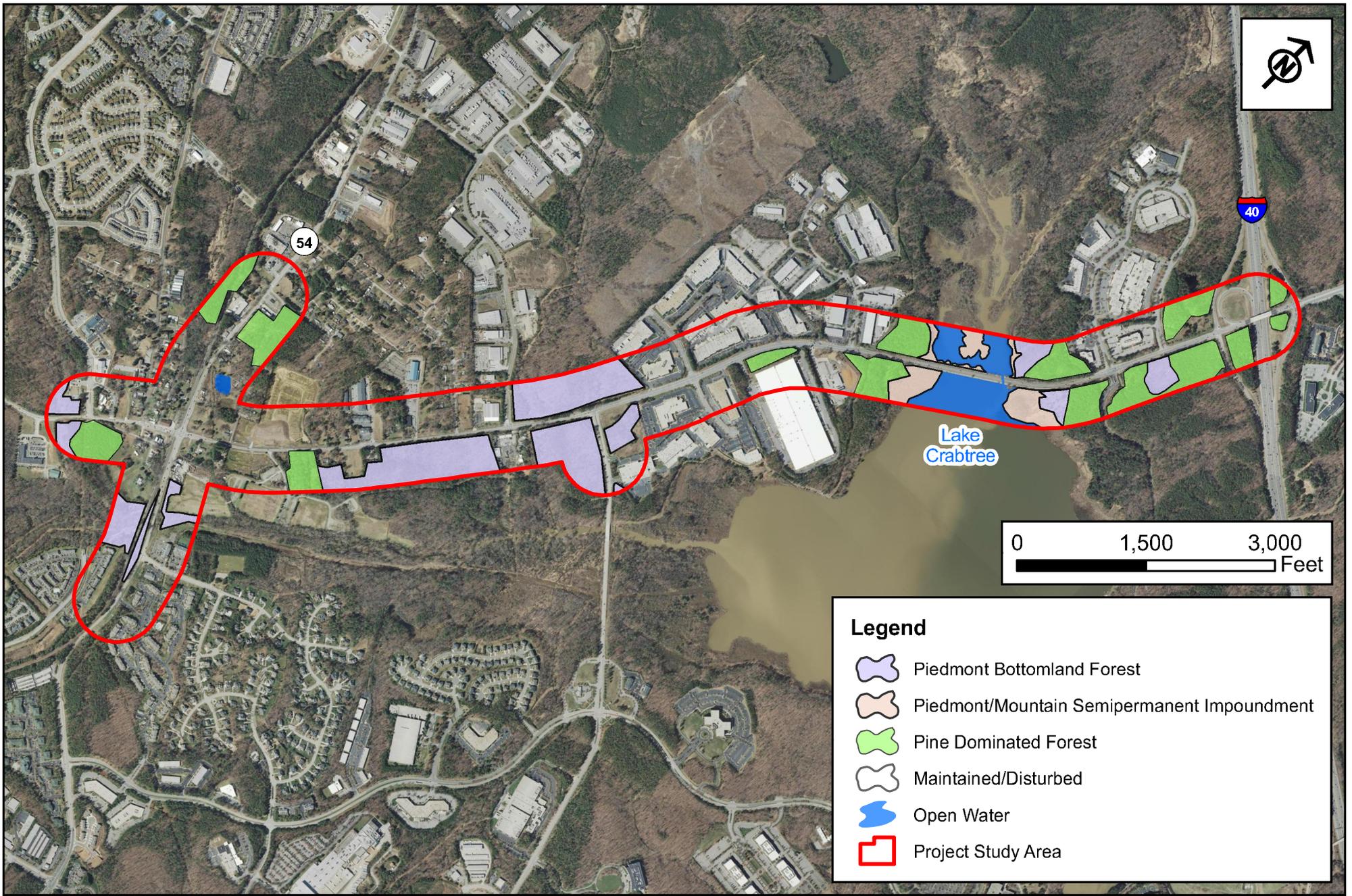


Figure 4: Terrestrial Communities Map
 TIP U-5811
 Widening of SR 1002 (Aviation Parkway)
 Morrisville and Cary, Wake County, NC

Appendix B

Scientific Names of Species Identified in Report

Plants

<u>Common Name</u>	<u>Scientific Name</u>
American elm	<i>Ulmus americana</i>
American beech	<i>Fagus grandifolia</i>
Black willow	<i>Salix nigra</i>
Cattail	<i>Typha</i> sp.
Chinese lespedeza	<i>Lespedeza cuneata</i>
Chinese privet	<i>Ligustrum sinense</i>
Clover	<i>Trifolium</i> spp.
Crepe myrtle	<i>Lagerstroemia</i> spp.
False-nettle	<i>Boehmeria cylindrica</i>
Fescue	<i>Festuca</i> spp.
Greenbrier	<i>Smilax rotundifolia</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Japanese stilt grass	<i>Microstegium vimineum</i>
Loblolly pine	<i>Pinus taeda</i>
Longleaf pine	<i>Pinus palustris</i>
Musclewood	<i>Carpinus caroliniana</i>
Northern red oak	<i>Quercus rubra</i>
Pignut hickory	<i>Carya glabra</i>
Poison ivy	<i>Toxicodendron radicans</i>
Princess tree	<i>Paulownia tomentosa</i>
Red maple	<i>Acer rubrum</i>
River oats	<i>Chasmanthium latifolium</i>
Sedge	<i>Carex</i> spp.
Sheep sorrel	<i>Rumex acetosella</i>
Silky dogwood	<i>Cornus amomum</i>
Smartweed	<i>Polygonum</i> spp.
Sweetgum	<i>Liquidambar styraciflua</i>
Tag alder	<i>Alnus serrulata</i>
Tree-of-heaven	<i>Ailanthus altissima</i>
Trumpet creeper	<i>Campsis radicans</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
Water oak	<i>Quercus nigra</i>
White oak	<i>Quercus alba</i>

Winged elm	<i>Ulmus alata</i>
Wild grape	<i>Vitis rotundifolia</i>
Wild onion	<i>Allium canadense</i>
Willow oak	<i>Quercus phellos</i>

Animals

<u>Common Name</u>	<u>Scientific Name</u>
American crow	<i>Corvus brachyrhynchos</i>
Barn swallow	<i>Hirundo rustica</i>
Belted kingfisher	<i>Megaceryle alcyon</i>
Black racer	<i>Coluber constrictor constrictor</i>
Black rat snake	<i>Elaphe obsoleta</i>
Bluegill	<i>Lepomis macrochirus</i>
Bullfrog	<i>Lithobates catesbeianus</i>
Carolina chickadee	<i>Poecile carolinensis</i>
Channel catfish	<i>Ictalurus punctatus</i>
Common mouse	<i>Mus musculus</i>
Copperhead	<i>Agkistrodon contortrix</i>
Crayfish	<i>Cambarus sp.</i>
Eastern box turtle	<i>Terrapene carolina carolina</i>
Eastern cottontail	<i>Sylvilagus floridanus mallurus</i>
Eastern fence lizard	<i>Sceloporus undulatus</i>
Eastern kingbird	<i>Tyrannus tyrannus</i>
Eastern ribbon snake	<i>Thamnophis sauritus sauritus</i>
Fantail darter	<i>Etheostoma flabellare</i>
Five-lined skink	<i>Plestiodon fasciatus</i>
Gray squirrel	<i>Sciurus carolinensis carolinensis</i>
Great blue heron	<i>Ardea herodias</i>
Green snake	<i>Opheodrys vernalis</i>
Largemouth bass	<i>Micropterus salmoides</i>
Mallard	<i>Anas platyrhynchos</i>
North American beaver	<i>Castor canadensis</i>
Northern mockingbird	<i>Mimus polyglottos</i>
Raccoon	<i>Procyon lotor</i>
Redbreast sunfish	<i>Lepomis auritus</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Snapping turtle	<i>Chelydra serpentina</i>
Spring peeper	<i>Pseudacris crucifer</i>
Swallowtail shiner	<i>Notropis procne</i>

Tufted titmouse

Turkey vulture

Virginia opossum

White-tailed deer

Wood duck

Baeolophus bicolor

Cathartes aura

Didelphis virginianus

Odocoileus virginianus

Axis sponsa

Appendix C

Stream and Wetland Data Forms

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Crabtree Creek TIP# U-5811	Latitude: 35.821122	Crabtree Creek U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.823145	
Total Points: 43.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 20.5	Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank	0	1	2	3	3
2. Sinuosity of channel along thalweg	0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3	1
4. Particle size of stream substrate	0	1	2	3	2
5. Active/relic floodplain	0	1	2	3	3
6. Depositional bars or benches	0	1	2	3	3
7. Recent alluvial deposits	0	1	2	3	2
8. Headcuts	0	1	2	3	0
9. Grade control	0	0.5	1	1.5	0.5
10. Natural valley	0	0.5	1	1.5	1
11. Second or greater order channel	No = 0		Yes = 3		3

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 10	Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow	0	1	2	3	3
13. Iron oxidizing bacteria	0	1	2	3	0
14. Leaf litter	1.5	1	0.5	0	1
15. Sediment on plants or debris	0	0.5	1	1.5	1.5
16. Organic debris lines or piles	0	0.5	1	1.5	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3		3

C. Biology Subtotal = 13	Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed	3	2	1	0	3
19. Rooted upland plants in streambed	3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3	2
21. Aquatic Mollusks	0	1	2	3	2
22. Fish	0	0.5	1	1.5	1
23. Crayfish	0	0.5	1	1.5	1
24. Amphibians	0	0.5	1	1.5	1
25. Algae	0	0.5	1	1.5	0
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:
 Crabtree Creek is a deeply-incised, perennial stream within the study corridor. The bankful height is 8' and the width is 16'. The water is 6"-2' deep and clear. The stream substrate is composed of sand, silt, and gravel, and flow was moderate. Aquatic mollusks, crayfish, fish, and caddisfly casings were observed in Crabtree Creek.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SA TIP# U-5811	Latitude: 35.819951	SA U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.824876	
Total Points: 37 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 19.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	3
5. Active/relic floodplain		0	1	2	3	3
6. Depositional bars or benches		0	1	2	3	3
7. Recent alluvial deposits		0	1	2	3	2
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	0
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 10		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1.5
15. Sediment on plants or debris		0	0.5	1	1.5	1.5
16. Organic debris lines or piles		0	0.5	1	1.5	1
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 7.5		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	1
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0.5
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SA is a deeply-incised, perennial tributary to Crabtree Creek. The floodplain of SA is indicative of frequent flooding. SA has a bankful height of 5' and width of 12'. The substrate is composed of silt and sand, and the flow is moderate. The water is clear and 2' deep. Mosquitofish were observed within SA.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SB TIP# U-5811	Latitude: 35.824833
Evaluator: B. Reed (Kimley-Horn) R. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.82526
Total Points: 42 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name: Cary Quad

**SB
U-5811**

A. Geomorphology Subtotal = 21		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	1
6. Depositional bars or benches		0	1	2	3	3
7. Recent alluvial deposits		0	1	2	3	3
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	1
10. Natural valley		0	0.5	1	1.5	1
11. Second or greater order channel		No = 0		Yes = 3		3

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 11		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	1
14. Leaf litter		1.5	1	0.5	0	1.5
15. Sediment on plants or debris		0	0.5	1	1.5	1
16. Organic debris lines or piles		0	0.5	1	1.5	1.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 10		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	1
21. Aquatic Mollusks		0	1	2	3	1
22. Fish		0	0.5	1	1.5	1.5
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0.5
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SB is a perennial tributary to Crabtree Creek. SB has a bankful height of 4' and width of 8'. The substrate is composed of silt, sand, and gravel, and the flow is moderate. The water is clear and 1-2' deep. Numerous minnows, juvenile fish, mollusk and mussel shells, and caddisfly casings were observed in SB.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/3/2016	Project/Site: Stream SD - (INT) TIP# U-5811	Latitude: 35.840102	SD-(INT) U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.81173	
Total Points: 23 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemera <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 10.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	1
5. Active/relic floodplain		0	1	2	3	0
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	0
8. Headcuts		0	1	2	3	1
9. Grade control		0	0.5	1	1.5	1
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 9.5		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	1
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	0.5
16. Organic debris lines or piles		0	0.5	1	1.5	1
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 3		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	1
19. Rooted upland plants in streambed		3	2	1	0	2
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SD is an intermittent channel that has downcut and intercepted groundwater. SD is intermittent after the culvert outlet beneath Aviation Parkway. The bankful width is 6' and the bankful depth is 2'. SD was holding water during our site visit due to recent rainfall event. The water was slightly turbid and had a slow velocity. The stream substrate is composed of silt, sand, and gravel. No aquatic biology was observed in SD.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/3/2016	Project/Site: Stream SD-PER TIP# U-5811	Latitude: 35.825575	SD-PER U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.820054	
Total Points: 34 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 14		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	2
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	2
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	0.5
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 9.5		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	1.5
16. Organic debris lines or piles		0	0.5	1	1.5	1
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 10.5		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	2
22. Fish		0	0.5	1	1.5	0.5
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	1.5
25. Algae		0	0.5	1	1.5	0.5
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SD is a perennial tributary to Crabtree Creek within the study corridor. The bankful height is 2' and the width is 7'. The water is 6-12" deep and slightly turbid, likely due to recent rainfall. The substrate in SD is composed of sand and silt, and the water velocity is moderate. Aquatic snails and mosquitofish were observed near the culvert inlet.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

**SE
U-5811**

Date: 8/4/2016	Project/Site: Stream SE TIP# U-5811	Latitude: 35.847099
Evaluator: B. Reed (Kimley-Horn) R. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.802108
Total Points: 20.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemera <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad

A. Geomorphology Subtotal = 9

	Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank	0	1	2	3	2
2. Sinuosity of channel along thalweg	0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3	1
4. Particle size of stream substrate	0	1	2	3	2
5. Active/relic floodplain	0	1	2	3	0
6. Depositional bars or benches	0	1	2	3	1
7. Recent alluvial deposits	0	1	2	3	0
8. Headcuts	0	1	2	3	0
9. Grade control	0	0.5	1	1.5	1
10. Natural valley	0	0.5	1	1.5	1
11. Second or greater order channel	No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 6.5

12. Presence of Baseflow	0	1	2	3	2
13. Iron oxidizing bacteria	0	1	2	3	0
14. Leaf litter	1.5	1	0.5	0	1
15. Sediment on plants or debris	0	0.5	1	1.5	0
16. Organic debris lines or piles	0	0.5	1	1.5	0.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3		3

C. Biology Subtotal = 5

18. Fibrous roots in streambed	3	2	1	0	1
19. Rooted upland plants in streambed	3	2	1	0	1
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3	0
21. Aquatic Mollusks	0	1	2	3	1
22. Fish	0	0.5	1	1.5	0
23. Crayfish	0	0.5	1	1.5	0
24. Amphibians	0	0.5	1	1.5	0.5
25. Algae	0	0.5	1	1.5	0
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; Other = 0				1.5

^aperennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SE is an intermittent channel originating at a culvert outlet underneath an adjacent parking lot. The entire reach is heavily lined with riprap. No flow was observed in channel reach, but pools of water are located throughout. The bankful depth is 1' and the width is 2'. The water in the pools was roughly 4" deep and clear. Small frogs and aquatic snails were observed in SE.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/4/2016	Project/Site: Stream SO TIP# U-5811	Latitude: 35.848016	SO U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.797983	
Total Points: 34.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent <u>Perennial</u>	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 17.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	1
6. Depositional bars or benches		0	1	2	3	2
7. Recent alluvial deposits		0	1	2	3	1
8. Headcuts		0	1	2	3	2
9. Grade control		0	0.5	1	1.5	1
10. Natural valley		0	0.5	1	1.5	1.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 9		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1.5
15. Sediment on plants or debris		0	0.5	1	1.5	0.5
16. Organic debris lines or piles		0	0.5	1	1.5	1
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 8		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0.5
24. Amphibians		0	0.5	1	1.5	1.5
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SO is a meandering perennial feature beginning at a pipe outlet at the toe of the fillslope at the Aviation Pkwy ramp to I-40. There are multiple headcuts in the reach and evidence of flooding. The bankful height is 1' and the width is 5'. The water is slightly turbid and 6"-1' deep. The stream substrate is composed of sand and gravel, and the water velocity is slow. Many frogs and tadpoles were observed in stream SO.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SP TIP# U-5811	Latitude: 35.831606	SP U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.815848	
Total Points: 39 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 18		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	1
6. Depositional bars or benches		0	1	2	3	2
7. Recent alluvial deposits		0	1	2	3	1
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	0.5
10. Natural valley		0	0.5	1	1.5	1.5
11. Second or greater order channel		No = 0		Yes = 3		3

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 10.5						
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	1
14. Leaf litter		1.5	1	0.5	0	1.5
15. Sediment on plants or debris		0	0.5	1	1.5	0.5
16. Organic debris lines or piles		0	0.5	1	1.5	1.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 10.5						
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	1
21. Aquatic Mollusks		0	1	2	3	2
22. Fish		0	0.5	1	1.5	0.5
23. Crayfish		0	0.5	1	1.5	1
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SP is a large stream that is deeply incised. SP is culverted under Aviation Parkway through two large (~5') culverts. Strong flow observed with approximately 1-3' of water in stream. The bankful height is 6' and the width is 10'. Substrate in stream SP is composed of silt, sand, and gravel.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SQ TIP# U-5811	Latitude: 35.829614	SQ U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.817219	
Total Points: 23.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 9.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	0
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	1
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	0
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	1
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	1
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 7.5		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	1
13. Iron oxidizing bacteria		0	1	2	3	1
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	0.5
16. Organic debris lines or piles		0	0.5	1	1.5	1
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 6.5		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0.5
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SQ is an intermittent channel beginning at a culvert outlet under Aviation Parkway, on the southern portion of the study area. Stream SQ is a linear stream, incised to nearly 4' and may have been historically channelized.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/3/2016	Project/Site: Stream SR TIP# U-5811	Latitude: 35.840125	SR U-5811
Evaluator: B. Reed (Kimley-Horn) R. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.811714	
Total Points: 29 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemera <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 11		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	2
2. Sinuosity of channel along thalweg		0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	3
6. Depositional bars or benches		0	1	2	3	0
7. Recent alluvial deposits		0	1	2	3	0
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	0.5
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 10						
12. Presence of Baseflow		0	1	2	3	3
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1.5
15. Sediment on plants or debris		0	0.5	1	1.5	1
16. Organic debris lines or piles		0	0.5	1	1.5	1.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 8						
18. Fibrous roots in streambed		3	2	1	0	2
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0.5
24. Amphibians		0	0.5	1	1.5	1
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				1.5

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SR is a strong intermittent channel that has been ditched in numerous places. The bankful width is 4' and the bankful depth is 1'. SR had moderate flow during our site visit, likely due to recent rainfall event. The water is turbid and the stream substrate is composed of silt, sand, and gravel. Numerous frogs were observed in stream SR.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SS TIP# U-5811	Latitude: 35.820534	SS U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.823187	
Total Points: 26.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 12.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	0
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	0
8. Headcuts		0	1	2	3	1
9. Grade control		0	0.5	1	1.5	1
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 8		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	1
13. Iron oxidizing bacteria		0	1	2	3	1
14. Leaf litter		1.5	1	0.5	0	1.5
15. Sediment on plants or debris		0	0.5	1	1.5	1
16. Organic debris lines or piles		0	0.5	1	1.5	0.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 6		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SS is a weak intermittent channel beginning at a headcut in an utility easement. No flow was observed, but there were a few pools with standing water present throughout the reach. The bankful height is 4' and the width is 6'. The substrate is composed of silt and sand. No aquatic biology was observed in stream SS.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream ST TIP# U-5811	Latitude: 35.820017	ST U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.823497	
Total Points: 19.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 10.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	1
4. Particle size of stream substrate		0	1	2	3	1
5. Active/relic floodplain		0	1	2	3	2
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	0
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	0.5
10. Natural valley		0	0.5	1	1.5	1
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 6		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	0
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	1
16. Organic debris lines or piles		0	0.5	1	1.5	1
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 3		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	2
19. Rooted upland plants in streambed		3	2	1	0	1
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream ST is a weak, intermittent channel draining wetland WX. ST likely flows during the wet season and in response to stormwater events. No flow was observed through the system, but soils were saturated in low areas. ST has a bankful height of 2' and width of 5'. The substrate is composed of silt. No flow or water was present.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SU - (INT) TIP# U-5811	Latitude: 35.819705	SU-(INT) U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.823815	
Total Points: 21.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemera <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 10	Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank	0	1	2	3	2
2. Sinuosity of channel along thalweg	0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3	1
4. Particle size of stream substrate	0	1	2	3	1
5. Active/relic floodplain	0	1	2	3	1
6. Depositional bars or benches	0	1	2	3	1
7. Recent alluvial deposits	0	1	2	3	1
8. Headcuts	0	1	2	3	0
9. Grade control	0	0.5	1	1.5	0.5
10. Natural valley	0	0.5	1	1.5	0.5
11. Second or greater order channel	No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 6	Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow	0	1	2	3	0
13. Iron oxidizing bacteria	0	1	2	3	0
14. Leaf litter	1.5	1	0.5	0	1.5
15. Sediment on plants or debris	0	0.5	1	1.5	1
16. Organic debris lines or piles	0	0.5	1	1.5	0.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3		3

C. Biology Subtotal = 5.5	Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed	3	2	1	0	2
19. Rooted upland plants in streambed	3	2	1	0	2
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3	0
21. Aquatic Mollusks	0	1	2	3	0
22. Fish	0	0.5	1	1.5	0
23. Crayfish	0	0.5	1	1.5	0
24. Amphibians	0	0.5	1	1.5	0
25. Algae	0	0.5	1	1.5	0
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; Other = 0				1.5

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SU is an intermittent reach that is supported primarily by stormwater from a nearby residential complex. SU transitions to a perennial stream as it approaches Crabtree Creek. SU has a bankful height of 2' and width of 6'. The substrate is composed of silt. Flow and water depth were not present. No aquatic biology was observed.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SU - (PER) TIP# U-5811	Latitude: 35.820128	SU-(PER) U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.824052	
Total Points: 30.5 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 17		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	2
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	2
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	1
6. Depositional bars or benches		0	1	2	3	2
7. Recent alluvial deposits		0	1	2	3	2
8. Headcuts		0	1	2	3	1
9. Grade control		0	0.5	1	1.5	1
10. Natural valley		0	0.5	1	1.5	1
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 7.5		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	2
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	1
16. Organic debris lines or piles		0	0.5	1	1.5	0.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 6		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	3
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

SU is a deeply-incised, perennial reach that receives back water from Crabtree Creek. SU transitions from an intermittent stream as it approaches Crabtree Creek. SU has a bankful height of 6' and width of 8'. The substrate is composed of silt and sand. The water is clear and has a slow velocity. No aquatic biology was observed, however there is evidence of wildlife use.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SW TIP# U-5811	Latitude: 35.820283	SW U-5811
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.82424	
Total Points: 19 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemera <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad	

A. Geomorphology Subtotal = 10.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	0
4. Particle size of stream substrate		0	1	2	3	1
5. Active/relic floodplain		0	1	2	3	2
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	1
8. Headcuts		0	1	2	3	1
9. Grade control		0	0.5	1	1.5	0
10. Natural valley		0	0.5	1	1.5	0.5
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 5.5		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	0
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	1
16. Organic debris lines or piles		0	0.5	1	1.5	0.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 3		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	1
19. Rooted upland plants in streambed		3	2	1	0	2
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SW is a small, intermittent channel in the floodplain of Crabtree Creek. SW begins at a headcut and only a few pools held water at the time of observation. The bankful height is 4' and the width is 5'. SW has a silt substrate.

North Carolina Division of Water Quality - Stream Identification Form, Version 4.11

Date: 8/2/2016	Project/Site: Stream SY TIP# U-5811	Latitude: 35.821914
Evaluator: J. Hartshorn (Kimley-Horn) W. Sullivan (Kimley-Horn)	County: Wake	Longitude: -78.826754
Total Points: 20 Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	Stream Determination (circle one) Ephemera <u>Intermittent</u> Perennial	Other e.g. Quad Name: Cary Quad

**SY
U-5811**

A. Geomorphology Subtotal = 9.5		Absent	Weak	Moderate	Strong	Score
1 ^a . Continuity of channel bed and bank		0	1	2	3	3
2. Sinuosity of channel along thalweg		0	1	2	3	1
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence		0	1	2	3	1
4. Particle size of stream substrate		0	1	2	3	2
5. Active/relic floodplain		0	1	2	3	1
6. Depositional bars or benches		0	1	2	3	1
7. Recent alluvial deposits		0	1	2	3	0
8. Headcuts		0	1	2	3	0
9. Grade control		0	0.5	1	1.5	0.5
10. Natural valley		0	0.5	1	1.5	0
11. Second or greater order channel		No = 0		Yes = 3		0

^a artificial ditches are not rated; see discussions in manual

B. Hydrology Subtotal = 5.5		Absent	Weak	Moderate	Strong	Score
12. Presence of Baseflow		0	1	2	3	1
13. Iron oxidizing bacteria		0	1	2	3	0
14. Leaf litter		1.5	1	0.5	0	1
15. Sediment on plants or debris		0	0.5	1	1.5	0
16. Organic debris lines or piles		0	0.5	1	1.5	0.5
17. Soil-based evidence of high water table?		No = 0		Yes = 3		3

C. Biology Subtotal = 5		Absent	Weak	Moderate	Strong	Score
18. Fibrous roots in streambed		3	2	1	0	2
19. Rooted upland plants in streambed		3	2	1	0	3
20. Macroinvertebrates (note diversity and abundance)		0	1	2	3	0
21. Aquatic Mollusks		0	1	2	3	0
22. Fish		0	0.5	1	1.5	0
23. Crayfish		0	0.5	1	1.5	0
24. Amphibians		0	0.5	1	1.5	0
25. Algae		0	0.5	1	1.5	0
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5; Other = 0				0

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Stream SY is a linear, weak intermittent channel carrying primarily stormwater and has downcut or been dugout. No water was present in SY and vegetation covered much of the channel. The bankful height is 1' and the width is 2'. The substrate is composed of silt and sand.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/2/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WA-UP
 Investigator(s): R. Sullivan & J. Hartshorn (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Levee/sewer easement Local relief (concave, convex, none): Convex Slope (%): 0-1%
 Subregion (LRR or MLRA): LRR P Lat: 35.821314 Long: -78.829335 Datum: NAD83
 Soil Map Unit Name: Congaree silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

The upland data point was taken ~26' south of and 1' higher in elevation than the wetland data point. The upland data point was take on a sewer/stormwater utility easement.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of wetland hydrology were observed at the upland data point location.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WA-UP

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>33.3%</u> (A/B)
1. <u>None</u>				
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species <u>35</u> x 3 = <u>105</u> FACU species <u>70</u> x 4 = <u>280</u> UPL species _____ x 5 = Column Totals: <u>105</u> (A) <u>385</u> (B) Prevalence Index = B/A = <u>3.67</u>
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. <u>None</u>				
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
_____ = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ___ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain)
Herb Stratum (Plot size: <u>15'</u>)				
1. <u>Elymus hystrix</u>	<u>30%</u>	<u>Y</u>	<u>FACU</u>	
2. <u>Sorgham halepense</u>	<u>30%</u>	<u>Y</u>	<u>FACU</u>	
3. <u>Solidago altissima</u>	<u>10%</u>	<u>N</u>	<u>FACU</u>	
4. <u>Rubus argutus</u>	<u>5%</u>	<u>N</u>	<u>FAC</u>	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
_____ = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u>Lonicera japonica</u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
_____ = Total Cover				Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<u>30%</u> = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: **WA-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-12"	10YR 5/3	95%	7.5YR 4/6	5%	C	M	Loam	
12-24"	10YR 4/2	90%	7.5YR 4/6	10%	C	M	Clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No hydric soil indicators were observed at the upland data point. The substrate became rocky below 24".

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/2/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WA-WET
 Investigator(s): R. Sullivan & J. Hartshorn Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Bottomland floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1%
 Subregion (LRR or MLRA): LRR P Lat: 35.821377 Long: -78.82929 Datum: NAD83
 Soil Map Unit Name: Congaree silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
---	---

Remarks:

Wetland WA is a bottomland floodplain wetland with a sewer easement running through the wetland.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>1"</u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>Surface</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The wetland receives hydrology from groundwater interface and flooding from stream SA.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WA-WET

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u><i>Acer rubrum</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>8</u> (A) Total Number of Dominant Species Across All Strata: <u>8</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)	
2. <u><i>Fraxinus pennsylvanica</i></u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>		
3. <u><i>Ulmus americana</i></u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>		
4. <u><i>Liquidambar styraciflua</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>		
5. _____					
6. _____					
7. _____					
8. _____					
<u>90%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <u><i>Carpinus caroliniana</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
<u>20%</u> = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ___ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: <u>15'</u>)					
1. <u><i>None</i></u>					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
_____ = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u><i>Smilax rotundifolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Lonicera japonica</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
3. _____					
4. _____					
5. _____					
6. _____					
<u>10%</u> = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: **WA-WET**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-2"	10YR 3/4	100%					Loam	
2-4"	10YR 5/2	75%	7.5YR 4/6	25%	C	M	Clay loam	
4-8"	10YR 5/1	90%	7.5YR 4/6	10%	C	M	Loam	
8-16"	10YR 6/2	90%	10YR 5/6	10%	C	M	Loam	
16-24"	7.5YR 4/6	90%	7.5YR 6/1	10%	D	M	Loam	
24-30"	5YR 5/6	95%	5YR 6/1	5%	D	PL	Clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

The soil was depleted. The water table and soil saturation were both observed near the soil surface.

WETLAND RATING WORKSHEET Fourth version

Wetland WN

Project Name: TIP# U-5811 Nearest road: Evans Rd.
 County: Wake County Wetland area: 0.02 acres Wetland width: 30 feet
 Name of Evaluator: R. Sullivan (Kimley-Horn) Date: 5/24/2014

<p>Wetland Location</p> <p><input type="checkbox"/> on pond or lake</p> <p><input checked="" type="checkbox"/> on perennial stream</p> <p><input type="checkbox"/> on intermittent stream</p> <p><input type="checkbox"/> within interstream divide</p> <p><input type="checkbox"/> other: _____</p> <p>Soil Series</p> <p><input type="checkbox"/> predominantly organic (humus, muck, or peat)</p> <p><input checked="" type="checkbox"/> predominantly mineral (non-sandy)</p> <p><input type="checkbox"/> predominantly sandy</p> <p>Hydrolic factors</p> <p><input type="checkbox"/> steep topography</p> <p><input type="checkbox"/> ditched or channelized</p> <p><input type="checkbox"/> total riparian wetland width \geq 100 ft</p>	<p>Adjacent land use (within 1/2 mile upstream, upslope, or radius)</p> <p><input checked="" type="checkbox"/> forested/natural vegetation <u>65</u> %</p> <p><input checked="" type="checkbox"/> agriculture, urban/suburban <u>5</u> %</p> <p><input checked="" type="checkbox"/> impervious service <u>30</u> %</p> <p>Dominant vegetation</p> <p>1) <u><i>Pinus taeda</i></u></p> <p>2) <u><i>Salix nigra</i></u></p> <p>3) <u><i>Acer rubrum</i></u></p> <p>Flooding and wetness</p> <p><input type="checkbox"/> semipermanently to permanently flooded or inundated</p> <p><input type="checkbox"/> seasonally flooded or inundated</p> <p><input checked="" type="checkbox"/> intermittently flooded or temporary surface water</p> <p><input type="checkbox"/> no evidence of flooding or surface water</p>
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Wetland type (select one)

<input checked="" type="checkbox"/> Bottomland hardwood forest	<input type="checkbox"/> Pine savanna
<input type="checkbox"/> Headwater forest	<input type="checkbox"/> Freshwater marsh
<input type="checkbox"/> Swamp forest	<input type="checkbox"/> Bog/fen
<input type="checkbox"/> Wet flat	<input type="checkbox"/> Ephemeral wetland
<input type="checkbox"/> Pocosin	<input type="checkbox"/> Carolina Bay
<input type="checkbox"/> Bog forest	<input type="checkbox"/> Other _____

*The rating system cannot be applied to salt or brackish marshes or stream channels.

				weight			
R	Water Storage	<u>2</u>	x	4.00	=	<u>8</u>	
A	Bank/Shoreline stabilization	<u>1</u>	x	4.00	=	<u>4</u>	
T	Pollutant removal	<u>2</u>	x	5.00	=	<u>10</u>	
I	Wildlife habitat	<u>2</u>	x	2.00	=	<u>4</u>	
N	Aquatic life	<u>2</u>	x	4.00	=	<u>8</u>	
G	Recreation/Education	<u>2</u>	x	1.00	=	<u>2</u>	
Total Score¹						<u>36</u>	

¹Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile radius.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 05/24/2014
 Applicant/Owner: NCDOT State: NC Sampling Point: WN-UP
 Investigator(s): B. Reed & R. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Slight hillslope Local relief (concave, convex, none): Convex Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.831748 Long: -78.811565 Datum: NAD83
 Soil Map Unit Name: Altavista fine sandy loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

Upland data point WN-UP is located approximately 163' feet southeast from WN-WET near the project boundary.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Saturation Present? (includes capillary fringe) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches):	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of wetland hydrology were observed at data point WN-UP during the site visit. Neither the water table nor soil saturation was observed in the first 20" of the soil profile.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WN-UP

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>7</u> (A) Total Number of Dominant Species Across All Strata: <u>8</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>87.5%</u> (A/B)
1. <u><i>Pinus taeda</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
4. <u><i>Quercus falcata</i></u>	<u>5%</u>	<u>N</u>	<u>FACU</u>	
5. <u><i>Juniperus virginiana</i></u>	<u>2%</u>	<u>N</u>	<u>FACU</u>	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
<u>47%</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
1. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Ilex opaca</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>	
3. <u><i>Morella cerifera</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
4. <u><i>Nyssa sylvatica</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>25%</u> = Total Cover				
Herb Stratum (Plot size: <u>30'</u>)				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain)
1. <u>None</u>	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
1. <u><i>Vitis rotundifolia</i></u>	<u>2%</u>	<u>Y</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>2%</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				
Remarks: (Include photo numbers here or on a separate sheet.) Vegetation at WN-UP did not display morphological characteristics consistent with wetland hydrology.				

SOIL

Sampling Point: **WN-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹		
0-2"	10YR 3/3	100%				Loam	
2-8"	10YR 7/4	100%				Loam	
8-14"	10YR 7/5	100%				Loam	
14-20"+	10YR 6/6	80%	10YR 7/3	20%	C	M	Loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:
 No indicators of hydric soils were observed during the site visit.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 05/24/2014
 Applicant/Owner: NCDOT State: NC Sampling Point: WN-WET
 Investigator(s): B. Reed & R. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Gentle hillslope Local relief (concave, convex, none): Concave Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.831746 Long: -78.811558 Datum: NAD83
 Soil Map Unit Name: Altavista fine sandy loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

Wetland WN receives stormwater flows from adjacent commercial development. A portion of the wetland is within a maintained sewer/stormwater easement. No precipitation was recorded within the 7 days prior to the site visit (NC CRONOS).

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>12"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The water table was not observed within the upper 18" of the soil profile. Soil saturation was observed at 12". The wetland is surrounded by commercial development, Evans Road, and a sewer/stormwater easement. Wetland WN likely receives hydrology from stormwater runoff from the surrounding impervious areas.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WN-WET

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u><i>Pinus taeda</i></u>	<u>40%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>11</u> (A) Total Number of Dominant Species Across All Strata: <u>11</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)
2. <u><i>Salix nigra</i></u>	<u>20%</u>	<u>Y</u>	<u>OBL</u>	
3. <u><i>Acer rubrum</i></u>	<u>15%</u>	<u>Y</u>	<u>FAC</u>	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
<u>75%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. <u><i>Morella cerifera</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Fraxinus pennsylvanica</i></u>	<u>5%</u>	<u>Y</u>	<u>FACW</u>	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
<u>25%</u> = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Herb Stratum (Plot size: <u>30'</u>)				
1. <u><i>Boehmeria cylindrica</i></u>	<u>2%</u>	<u>Y</u>	<u>FACW</u>	
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
<u>2%</u> = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u><i>Campsis radicans</i></u>	<u>2%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Smilax rotundifolia</i></u>	<u>2%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Vitis rotundifolia</i></u>	<u>2%</u>	<u>Y</u>	<u>FAC</u>	
4. <u><i>Lonicera japonica</i></u>	<u>2%</u>	<u>Y</u>	<u>FAC</u>	
5. _____				
6. _____				
<u>8%</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				

Remarks: (Include photo numbers here or on a separate sheet.)

The wetland is surrounded by commercial development, a road, and a sewer/stormwater easement. The vegetation community appears to have been historically cleared due to the abundance of young loblolly pines and red maples.

SOIL

Sampling Point: WN-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-4"	10YR 4/2	95%	10YR 5/6	5%	C	M	Loamy clay	
3-10"	10YR 6/2	90%	10YR 5/6	10%	C	M	Loamy clay	
10-18"	10YR 6/1	50%	10YR 7/6	50%	C	M	Clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

Soil saturation was observed at 12".

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/4/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WS-UP
 Investigator(s): J. Hartshorn & W. Sullivan Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Slight hillslope Local relief (concave, convex, none): None Slope (%): 1-2%
 Subregion (LRR or MLRA): LRR P Lat: 35.839954 Long: -78.807077 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

Data point WS-UP is a slight hillslope above wetland WS. Lake Crabtree may occasionally flood WS-UP, but the hillslope prevents water from ponding.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
--	--

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators were observed.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WS-UP

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u><i>Quercus nigra</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>7</u> (A) Total Number of Dominant Species Across All Strata: <u>7</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)	
2. <u><i>Acer rubrum</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>		
3. <u><i>Pinus taeda</i></u>	<u>15%</u>	<u>N</u>	<u>FAC</u>		
4. <u><i>Ulmus americana</i></u>	<u>10%</u>	<u>N</u>	<u>FACW</u>		
5. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>N</u>	<u>FAC</u>		
6. _____					
7. _____					
8. _____					
	<u>85%</u> = Total Cover			Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Vaccinium sp.</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
3. <u><i>Carya glabra</i></u>	<u>5%</u>	<u>N</u>	<u>FACU</u>		
4. <u><i>Quercus nigra</i></u>	<u>5%</u>	<u>N</u>	<u>FAC</u>		
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
	<u>30%</u> = Total Cover			Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: <u>30'</u>)					
1. <u><i>None</i></u>					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	_____ = Total Cover			Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u><i>Vitis rotundifolia</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Smilax rotundifolia</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
3. <u><i>Campsis radicans</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
4. _____					
5. _____					
6. _____					
	<u>25%</u> = Total Cover			Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: **WS-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2"	10YR 3/2	100%					Loam	
2-10"	10YR 3/4	100%					Loam	
10-16"	10YR 6/3	100%					Loam	
16-24"	10YR 6/3	50%					Loam	*Split matrix
	10YR 7/4	50%						

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No hydric soil indicators, water table, or saturation were observed.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/4/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WS-WET
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Bottomland Local relief (concave, convex, none): None Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.840087 Long: -78.806991 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

Wetland WS is a bottomland forest adjacent to Lake Crabtree. Drift deposits and alluvial sediment indicate frequent flooding of depths up to 3'.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input checked="" type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input checked="" type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations:

Surface Water Present? Yes No Depth (inches):
 Water Table Present? Yes No Depth (inches): >24"
 Saturation Present? Yes No Depth (inches): >24"
 (includes capillary fringe)

Wetland Hydrology Present? Yes No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland WS is a frequently flooded bottomland forest. WS transitions to an emergent wetland with a stunted canopy and understory closer to Lake Crabtree.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WS-WET

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u><i>Ulmus americana</i></u>	<u>40%</u>	<u>Y</u>	<u>FACW</u>
2. <u><i>Acer rubrum</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>
3. <u><i>Pinus taeda</i></u>	<u>15%</u>	<u>N</u>	<u>FAC</u>
4. <u><i>Betula nigra</i></u>	<u>10%</u>	<u>N</u>	<u>FACW</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____

85% = Total Cover

Sapling/Shrub Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u><i>Ulmus alata</i></u>	<u>10%</u>	<u>Y</u>	<u>FACU</u>
2. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____

20% = Total Cover

Herb Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u><i>Microstegium vimineum</i></u>	<u>25%</u>	<u>Y</u>	<u>FAC</u>
2. <u><i>Juncus effusus</i></u>	<u>15%</u>	<u>Y</u>	<u>FACW</u>
3. <u><i>Polygonum sp.</i></u>	<u>10%</u>	<u>N</u>	<u>FAC</u>
4. <u><i>Boehmeria cylindrica</i></u>	<u>10%</u>	<u>N</u>	<u>FACW</u>
5. <u><i>Carex sp.</i></u>	<u>5%</u>	<u>N</u>	<u>FAC</u>
6. <u><i>Rubus argutus</i></u>	<u>5%</u>	<u>N</u>	<u>FACU</u>
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____

70% = Total Cover

Woody Vine Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u><i>Toxicodendron radicans</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____

5% = Total Cover

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 85.7% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species _____ x 1 = _____

FACW species _____ x 2 = _____

FAC species _____ x 3 = _____

FACU species _____ x 4 = _____

UPL species _____ x 5 = _____

Column Totals: _____ (A) _____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0¹
- 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes No

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **WS-WET**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-4"	10YR 4/3	100%					Clay loam	
4-16"	10YR 5/2	60%	7.5Y 5/4	40%	C	M	Loamy clay	
16-24"	10YR 5/1	90%	7.5Y 5/6	10%	C	M	Loamy clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No water table or saturation was observed at data point WS-WET.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WT-UP
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Slight hillslope Local relief (concave, convex, none): Convex Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.832288 Long: -78.815572 Datum: NAD83
 Soil Map Unit Name: Creedmoor silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

The data point WT-UP is located approximately 40' east from and 1' higher than the wetland data point WT-WET.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>16"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>16"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of wetland hydrology were observed at WT-UP during the site visit. Neither the water table nor soil saturation were observed within the upper 16" of the soil profile.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WT-UP

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u><i>Quercus alba</i></u>	<u>30%</u>	<u>Y</u>	<u>FACU</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>6</u> (A) Total Number of Dominant Species Across All Strata: <u>8</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>75%</u> (A/B)	
2. <u><i>Pinus taeda</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>		
3. <u><i>Acer rubrum</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>		
4. <u><i>Quercus phellos</i></u>	<u>15%</u>	<u>N</u>	<u>FAC</u>		
5. _____					
6. _____					
7. _____					
8. _____					
<u>95%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <u><i>Fraxinus pennsylvanica</i></u>	<u>10%</u>	<u>Y</u>	<u>FACW</u>		
2. <u><i>Nyssa sylvatica</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
3. <u><i>Cornus florida</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>		
4. <u><i>Vaccinium fuscatum</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
<u>25%</u> = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: <u>30'</u>)					
1. <u>None</u>					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
_____ = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u><i>Vitis rotundifolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
<u>5%</u> = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	

Remarks: (Include photo numbers here or on a separate sheet.)

No morphological adaptations for wetland conditions were observed during the site visit.

SOIL

Sampling Point: **WT-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-6"	10YR 4/3	100%					Loam	
6-10"	10YR 6/4	70%	10YR 5/8	30%	Mottle	M	Loam	
10-16"	10YR 6/4	70%	10YR 5/6	30%			Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No indicators of hydric soils were observed at data point WT-UP during the site visit. Neither the water table nor soil saturation were observed within the first 16" of the soil profile.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WT-WET
 Investigator(s): B. Reed & R. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1%
 Subregion (LRR or MLRA): LRR P Lat: 35.832081 Long: -78.815701 Datum: NAD83
 Soil Map Unit Name: Creedmoor silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

Wetland WT is a bottomland floodplain adjacent (north) to Stream SP.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input checked="" type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations:

Surface Water Present? Yes No Depth (inches):
 Water Table Present? Yes No Depth (inches): >16"
 Saturation Present? (includes capillary fringe) Yes No Depth (inches): >16"
 Wetland Hydrology Present? Yes No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soil was moist at 16" at data point WT-WET. However, no soil saturation or water table was observed at the data point. Standing water was observed within the wetland at approximately 3" deep. Hydrology mainly from groundwater and overland flow from Stream SP.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WT-WET

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Salix nigra</u>	<u>15%</u>	Y	OBL	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>9</u> (A) Total Number of Dominant Species Across All Strata: <u>11</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>81.8%</u> (A/B)
2. <u>Quercus phellos</u>	<u>10%</u>	Y	FAC	
3. <u>Fraxinus pennsylvanica</u>	<u>10%</u>	Y	FACW	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
<u>35%</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Salix nigra</u>	<u>10%</u>	Y	OBL	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
2. <u>Liquidambar styraciflua</u>	<u>5%</u>	Y	FAC	
3. <u>Quercus phellos</u>	<u>5%</u>	Y	FAC	
4. <u>Ulmus americana</u>	<u>5%</u>	Y	FACW	
5. <u>Rubus argutus</u>	<u>5%</u>	Y	FACU	
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
<u>30%</u> = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Microstegium vimineum</u>	<u>45%</u>	Y	FAC	Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. <u>Murdannia keisak</u>	<u>35%</u>	Y	OBL	
3. <u>Juncus effusus</u>	<u>10%</u>	N	FACW	
4. <u>Typha latifolia</u>	<u>5%</u>	N	OBL	
5. <u>Carex sp.</u>	<u>5%</u>	N	FAC	
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
<u>100%</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Parthenocissus quinquefolia</u>	<u>5%</u>	Y	FACU	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
<u>5%</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				

Remarks: (Include photo numbers here or on a separate sheet.)

There is a distinct change in vegetation between the wetland and the upland areas. The wetland has nearly complete groundcover of herbaceous plants adapted for hydric environments (Juncus, Typha, Murdannia).

SOIL

Sampling Point: WT-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-4"	7.5YR 4/2	70%	10YR 4/4	30%	C	M	Clay loam	
4-10"	7.5YR 5/2	65%	7.5YR 4/6	35%			Loam clay	
10-16"+	7.5YR 4/1	60%	7.5YR 5/8	40%			Clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

Neither the water table nor soil saturation was observed at data point WT-WET during the site visit. However, surface water was observed ponded in wetland WT.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WU-UP
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Hummock Local relief (concave, convex, none): None Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.827961 Long: -78.817489 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

Uplands surrounding wetland WU are composed of dry hummocks that extend into the wetland. No water-stained leaves or debris piles are present on the hummocks.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators were observed at WU-UP.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WU-UP

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet:
1. <u><i>Pinus taeda</i></u>	<u>40%</u>	<u>Y</u>	<u>FAC</u>	Number of Dominant Species That Are OBL, FACW, or FAC: <u>8</u> (A)
2. <u><i>Quercus rubra</i></u>	<u>10%</u>	<u>Y</u>	<u>FACU</u>	Total Number of Dominant Species Across All Strata: <u>10</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>80%</u> (A/B)
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
	<u>50%</u> = Total Cover			Prevalence Index worksheet:
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				Total % Cover of: _____ Multiply by:
1. <u><i>Ulmus americana</i></u>	<u>10%</u>	<u>Y</u>	<u>FACW</u>	OBL species _____ x 1 =
2. <u><i>Acer rubrum</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	FACW species _____ x 2 =
3. <u><i>Pinus taeda</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	FAC species _____ x 3 =
4. <u><i>Liquidambar styraciflua</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	FACU species _____ x 4 =
5. _____	_____	_____	_____	UPL species _____ x 5 =
6. _____	_____	_____	_____	Column Totals: _____ (A) _____ (B)
7. _____	_____	_____	_____	Prevalence Index = B/A =
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	Hydrophytic Vegetation Indicators:
10. _____	_____	_____	_____	<input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation
	<u>25%</u> = Total Cover			<input checked="" type="checkbox"/> 2 - Dominance Test is >50%
Herb Stratum (Plot size: <u>30'</u>)				<input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹
1. <u><i>Rubus argutus</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>	<input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)
2. <u><i>Microstegium vimineum</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	<input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
3. _____	_____	_____	_____	¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	Definitions of Four Vegetation Strata:
6. _____	_____	_____	_____	Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
7. _____	_____	_____	_____	Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.
8. _____	_____	_____	_____	Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
9. _____	_____	_____	_____	Woody vine – All woody vines greater than 3.28 ft in height.
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
	<u>10%</u> = Total Cover			Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u><i>Campsis radicans</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Toxicodendron radicans</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
	<u>20%</u> = Total Cover			
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: **WU-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-4"	10YR 4/3	100%					Loam	
4-24"	10YR 6/3	80%	10YR 5/6	20%	C	M	Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

Soils are dry and friable. No water table or saturation was observed.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WU-WET
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Bottomland Local relief (concave, convex, none): Concave Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.828618 Long: -78.817180 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

WU is a bottomland forest within the larger floodplain of Crabtree Creek. A sanitary sewer utility easement near the study area boundary appears to have modified natural flooding from Crabtree Creek. WU is fragmented by dry hummocks.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations:

Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): >20" Saturation Present? (includes capillary fringe) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): >20"	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WU is a bottomland forest that appears to be periodically inundated from Crabtree Creek overflow and significant rain events. Debris piles and drift deposits were present at the base of many trees.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WU-WET

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u><i>Quercus phellos</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>8</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>89%</u> (A/B)	
2. <u><i>Fraxinus pennsylvanica</i></u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>		
3. <u><i>Pinus taeda</i></u>	<u>10%</u>	<u>N</u>	<u>FAC</u>		
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
<u>60%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Ulmus americana</i></u>	<u>10%</u>	<u>Y</u>	<u>FACW</u>		
3. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
<u>30%</u> = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: <u>30'</u>)					
1. <u><i>Carex sp.</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Rubus argutus</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
<u>15%</u> = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u><i>Smilax rotundifolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Toxicodendron radicans</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
3. _____					
4. _____					
5. _____					
6. _____					
<u>10%</u> = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: **WU-WET**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-6"	2.5Y 6/2	90%	7.5YR 4/6	10%	C	PL	Clay loam	
6-20"	2.5Y 6/1	70%	10YR 6/8	30%	C	M	Clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 147, 148)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 136, 147)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)		
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)		
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)		
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Red Parent Material (F21) (MLRA 127, 147)		

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: Depth (inches):	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

No saturation or water table was observed at data point WU-WET. Pore linings observed in upper 6", below 6" is heavily depleted with significant concentrations.

WETLAND RATING WORKSHEET Fourth version

Wetland WV

Project Name: TIP# U-5811 Nearest road: Aviation Parkway
 County: Wake County Wetland area: 0.9 acres Wetland width: 250 feet
 Name of Evaluator: J. Hartshorn (Kimley-Horn) Date: 8/24/2016

<p>Wetland Location</p> <p><input type="checkbox"/> on pond or lake</p> <p><input checked="" type="checkbox"/> on perennial stream</p> <p><input type="checkbox"/> on intermittent stream</p> <p><input type="checkbox"/> within interstream divide</p> <p><input type="checkbox"/> other: _____</p> <p>Soil Series</p> <p><input type="checkbox"/> predominantly organic (humus, muck, or peat)</p> <p><input checked="" type="checkbox"/> predominantly mineral (non-sandy)</p> <p><input type="checkbox"/> predominantly sandy</p> <p>Hydrolic factors</p> <p><input type="checkbox"/> steep topography</p> <p><input type="checkbox"/> ditched or channelized</p> <p><input checked="" type="checkbox"/> total riparian wetland width \geq 100 ft</p>	<p>Adjacent land use (within 1/2 mile upstream, upslope, or radius)</p> <p><input checked="" type="checkbox"/> forested/natural vegetation <u>60</u> %</p> <p><input checked="" type="checkbox"/> agriculture, urban/suburban <u>20</u> %</p> <p><input checked="" type="checkbox"/> impervious service <u>20</u> %</p> <p>Dominant vegetation</p> <p>1) <u>Fraxinus pennsylvanica</u></p> <p>2) <u>Acer rubrum</u></p> <p>3) <u>Pinus taeda</u></p> <p>Flooding and wetness</p> <p><input type="checkbox"/> semipermanently to permanently flooded or inundated</p> <p><input type="checkbox"/> seasonally flooded or inundated</p> <p><input checked="" type="checkbox"/> intermittently flooded or temporary surface water</p> <p><input type="checkbox"/> no evidence of flooding or surface water</p>
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Wetland type (select one)

- | | |
|---|--|
| <p><input checked="" type="checkbox"/> Bottomland hardwood forest</p> <p><input type="checkbox"/> Headwater forest</p> <p><input type="checkbox"/> Swamp forest</p> <p><input type="checkbox"/> Wet flat</p> <p><input type="checkbox"/> Pocosin</p> <p><input type="checkbox"/> Bog forest</p> | <p><input type="checkbox"/> Pine savanna</p> <p><input type="checkbox"/> Freshwater marsh</p> <p><input type="checkbox"/> Bog/fen</p> <p><input type="checkbox"/> Ephemeral wetland</p> <p><input type="checkbox"/> Carolina Bay</p> <p><input type="checkbox"/> Other _____</p> |
|---|--|

*The rating system cannot be applied to salt or brackish marshes or stream channels.

				weight			
R	Water Storage	<u>3</u>	x	4.00	=	<u>12</u>	
A	Bank/Shoreline stabilization	<u>3</u>	x	4.00	=	<u>12</u>	
T	Pollutant removal	<u>3</u>	x	5.00	=	<u>15</u>	
I	Wildlife habitat	<u>3</u>	x	2.00	=	<u>6</u>	
N	Aquatic life	<u>3</u>	x	4.00	=	<u>12</u>	
G	Recreation/Education	<u>2</u>	x	1.00	=	<u>2</u>	
Total Score¹						<u>59</u>	

¹Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile radius.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/03/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WV-UP
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Slight hillslope Local relief (concave, convex, none): None Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.829488 Long: -78.815972 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

Uplands around wetland WV are composed of slight hillslopes, levees, and hummocks. Uplands are distinguishable by a 1' to 2' change in elevation and the absence of water-stained leaves and debris piles.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators were observed.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WV-UP

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u><i>Pinus taeda</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>7</u> (A) Total Number of Dominant Species Across All Strata: <u>11</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>64%</u> (A/B)
2. <u><i>Quercus rubra</i></u>	<u>10%</u>	<u>Y</u>	<u>FACU</u>	
3. <u><i>Carya glabra</i></u>	<u>10%</u>	<u>Y</u>	<u>FACU</u>	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
<u>50%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. <u><i>Ulmus americana</i></u>	<u>10%</u>	<u>Y</u>	<u>FACW</u>	
2. <u><i>Acer rubrum</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Pinus taeda</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
4. <u><i>Carya glabra</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
<u>25%</u> = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Herb Stratum (Plot size: <u>30'</u>)				
1. <u><i>Rubus argutus</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>	
2. <u><i>Microstegium vimineum</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
<u>10%</u> = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u><i>Campsis radicans</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Toxicodendron radicans</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
3. _____				
4. _____				
5. _____				
6. _____				
<u>20%</u> = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: WV-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-4"	10YR 4/3						Loam	
4-24"	10YR 6/3	80%	10YR 5/6	20%	C	M	Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

Soils are dry and friable. No water table or saturation was observed.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WV-WET
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Bottomland Local relief (concave, convex, none): None Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.829695 Long: -78.816126 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

WV is a bottomland forest associated with the Crabtree Creek floodplain. WV is bounded by a commercial building to the north and a levee to the south.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations:

Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): >20" Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): >20" (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
--	--

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WV is a floodplain forest that receives hydrology from Crabtree Creek overflow and stormwater runoff from the adjacent commercial facility. Drift deposits are present throughout the wetland.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WV-WET

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u><i>Fraxinus pennsylvanica</i></u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>8</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>89%</u> (A/B)	
2. <u><i>Acer rubrum</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>		
3. <u><i>Pinus taeda</i></u>	<u>15%</u>	<u>Y</u>	<u>FAC</u>		
4. <u><i>Carya glabra</i></u>	<u>5%</u>	<u>N</u>	<u>FACU</u>		
5. _____					
6. _____					
7. _____					
8. _____					
<u>60%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
<u>25%</u> = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: <u>30'</u>)					
1. <u><i>Carex sp.</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Boehmeria cylindrica</i></u>	<u>5%</u>	<u>Y</u>	<u>FACW</u>		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
<u>15%</u> = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u><i>Smilax rotundifolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Parthenocissus quinquefolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>		
3. _____					
4. _____					
5. _____					
6. _____					
<u>10%</u> = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: WV-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-6"	2.5Y 6/2	95%	7.5YR 4/6	5%	C	PL	Clay loam	
6-20"	2.5Y 6/1	70%	10YR 6/8	30%	C	M	Clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:
 No saturation or water table was observed at data point WV-WET.

WETLAND RATING WORKSHEET Fourth version

Wetland WW

Project Name: TIP# U-5811 Nearest road: Aviation Parkway
 County: Wake County Wetland area: 1.3 acres Wetland width: 450 feet
 Name of Evaluator: J. Hartshorn (Kimley-Horn) Date: 8/3/2016

<p>Wetland Location</p> <p><input type="checkbox"/> on pond or lake</p> <p><input checked="" type="checkbox"/> on perennial stream</p> <p><input type="checkbox"/> on intermittent stream</p> <p><input type="checkbox"/> within interstream divide</p> <p><input type="checkbox"/> other: _____</p> <p>Soil Series</p> <p><input type="checkbox"/> predominantly organic (humus, muck, or peat)</p> <p><input checked="" type="checkbox"/> predominantly mineral (non-sandy)</p> <p><input type="checkbox"/> predominantly sandy</p> <p>Hydrolic factors</p> <p><input type="checkbox"/> steep topography</p> <p><input type="checkbox"/> ditched or channelized</p> <p><input checked="" type="checkbox"/> total riparian wetland width \geq 100 ft</p>	<p>Adjacent land use (within 1/2 mile upstream, upslope, or radius)</p> <p><input checked="" type="checkbox"/> forested/natural vegetation <u>60</u> %</p> <p><input checked="" type="checkbox"/> agriculture, urban/suburban <u>20</u> %</p> <p><input checked="" type="checkbox"/> impervious service <u>20</u> %</p> <p>Dominant vegetation</p> <p>1) <u>Quercus phellos</u></p> <p>2) <u>Fraxinus pennsylvanica</u></p> <p>3) <u>Quercus rubra</u></p> <p>Flooding and wetness</p> <p><input type="checkbox"/> semipermanently to permanently flooded or inundated</p> <p><input type="checkbox"/> seasonally flooded or inundated</p> <p><input checked="" type="checkbox"/> intermittently flooded or temporary surface water</p> <p><input type="checkbox"/> no evidence of flooding or surface water</p>
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Wetland type (select one)

- | | |
|---|--|
| <p><input checked="" type="checkbox"/> Bottomland hardwood forest</p> <p><input type="checkbox"/> Headwater forest</p> <p><input type="checkbox"/> Swamp forest</p> <p><input type="checkbox"/> Wet flat</p> <p><input type="checkbox"/> Pocosin</p> <p><input type="checkbox"/> Bog forest</p> | <p><input type="checkbox"/> Pine savanna</p> <p><input type="checkbox"/> Freshwater marsh</p> <p><input type="checkbox"/> Bog/fen</p> <p><input type="checkbox"/> Ephemeral wetland</p> <p><input type="checkbox"/> Carolina Bay</p> <p><input type="checkbox"/> Other _____</p> |
|---|--|

*The rating system cannot be applied to salt or brackish marshes or stream channels.

				weight			
R	Water Storage	<u>3</u>	x	4.00	=	<u>12</u>	
A	Bank/Shoreline stabilization	<u>3</u>	x	4.00	=	<u>12</u>	
T	Pollutant removal	<u>4</u>	x	5.00	=	<u>20</u>	
I	Wildlife habitat	<u>4</u>	x	2.00	=	<u>8</u>	
N	Aquatic life	<u>3</u>	x	4.00	=	<u>12</u>	
G	Recreation/Education	<u>2</u>	x	1.00	=	<u>2</u>	
Total Score¹						<u>66</u>	

¹Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile radius.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WW-UP
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Slight hillslope Local relief (concave, convex, none): None Slope (%): 1-2%
 Subregion (LRR or MLRA): LRR P Lat: 35.827334 Long: -78.818032 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

Data point WW-UP was taken on a slight hillslope over wetland WW. WW-UP was higher in elevation than the drift deposits present in wetland WW and there were no water-stained leaves at WW-UP.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>24"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
--	--

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators were observed.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WW-UP

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u><i>Pinus taeda</i></u>	<u>40%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>7</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>77.8%</u> (A/B)
2. <u><i>Ulmus americana</i></u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>	
3. <u><i>Quercus rubra</i></u>	<u>10%</u>	<u>N</u>	<u>FACU</u>	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
<u>70%</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. <u><i>Ulmus americana</i></u>	<u>10%</u>	<u>Y</u>	<u>FACW</u>	
2. <u><i>Prunus serotina</i></u>	<u>10%</u>	<u>Y</u>	<u>FACU</u>	
3. <u><i>Acer rubrum</i></u>	<u>5%</u>	<u>N</u>	<u>FAC</u>	
4. <u><i>Pinus taeda</i></u>	<u>5%</u>	<u>N</u>	<u>FAC</u>	
5. <u><i>Juniperus virginiana</i></u>	<u>5%</u>	<u>N</u>	<u>FACU</u>	
6. _____				
7. _____				
8. _____				
<u>35%</u> = Total Cover				
Herb Stratum (Plot size: <u>30'</u>)				
1. <u><i>Microstegium vimineum</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Rubus argutus</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>	
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
<u>25%</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u><i>Campsis radicans</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Toxicodendron radicans</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Smilax rotundifolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
4. _____				
5. _____				
6. _____				
<u>25%</u> = Total Cover				
Hydrophytic Vegetation Present?				
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				

Remarks: (Include photo numbers here or on a separate sheet.)

Loblolly pine is much more prevalent in the uplands bordering wetland WW.

SOIL

Sampling Point: WW-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-4"	10YR 4/3	100%					Loam	
4-24"	10YR 6/3	80%	10YR 5/6	20%	C	M	Loam	*Diffuse boundaries

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

Soils are not depleted below 4", but the observed concentrations are faint/diffuse. Soils are dry and friable, no water table or saturation was observed.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WW-WET
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Bottomland Local relief (concave, convex, none): Concave Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.826962 Long: -78.818056 Datum: NAD83
 Soil Map Unit Name: WhA - Warne fine sandy loam, 0 to 2 percent slopes NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

WW is a bottomland forest within the larger floodplain of Crabtree Creek. WW is bounded topographically between an upland slope and utility easement.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input checked="" type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>20"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>20"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
--	--

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WW is a floodplain forest that appears to be periodically inundated. Water-stained leaves are present throughout the wetland and drift deposits indicate 1-2' of water flowing through the forest.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WW-WET

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u><i>Quercus phellos</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>5</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>55.6%</u> (A/B)	
2. <u><i>Fraxinus pennsylvanica</i></u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>		
3. <u><i>Quercus rubra</i></u>	<u>20%</u>	<u>Y</u>	<u>FACU</u>		
4. <u><i>Pinus taeda</i></u>	<u>10%</u>	<u>N</u>	<u>FAC</u>		
5. _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
6. _____					
7. _____					
8. _____					
<u>80%</u> = Total Cover					
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <u><i>Acer rubrum</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>		Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. <u><i>Ulmus americana</i></u>	<u>10%</u>	<u>Y</u>	<u>FACW</u>		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
<u>20%</u> = Total Cover					
Herb Stratum (Plot size: <u>30'</u>)					
1. <u><i>Chasmanthium latifolium</i></u>	<u>10%</u>	<u>Y</u>	<u>FACU</u>	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height. Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
2. <u><i>Rubus argutus</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
<u>15%</u> = Total Cover					
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u><i>Smilax rotundifolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>		
2. <u><i>Parthenocissus quinquefolia</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>		
3. <u><i>Campsis radicans</i></u>	<u>2%</u>	<u>N</u>	<u>FAC</u>		
4. _____					
5. _____					
6. _____					
<u>12%</u> = Total Cover					

Remarks: (Include photo numbers here or on a separate sheet.)

Many buttressed trees were observed in WW and most trees have drift deposits piled against trunks.

SOIL

Sampling Point: WW-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-6"	2.5Y 6/2	90%	7.5YR 4/6	10%	C	PL	Clay loam	
6-20"	2.5Y 6/1	70%	10YR 6/8	30%	C	M	Clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No saturation or water table was observed at data point WW-WET. Pore linings observed in upper 6", below 6" is heavily depleted with significant concentrations.

WETLAND RATING WORKSHEET Fourth version

Wetland WX

Project Name: TIP# U-5811 Nearest road: NC-54
 County: Wake County Wetland area: 0.2 acres Wetland width: 90 feet
 Name of Evaluator: J. Hartshorn (Kimley-Horn) Date: 8/2/2016

<p>Wetland Location</p> <p><input type="checkbox"/> on pond or lake</p> <p><input type="checkbox"/> on perennial stream</p> <p><input checked="" type="checkbox"/> on intermittent stream</p> <p><input type="checkbox"/> within interstream divide</p> <p><input type="checkbox"/> other: _____</p> <p>Soil Series</p> <p><input type="checkbox"/> predominantly organic (humus, muck, or peat)</p> <p><input checked="" type="checkbox"/> predominantly mineral (non-sandy)</p> <p><input type="checkbox"/> predominantly sandy</p> <p>Hydrolic factors</p> <p><input type="checkbox"/> steep topography</p> <p><input type="checkbox"/> ditched or channelized</p> <p><input type="checkbox"/> total riparian wetland width ≥ 100 ft</p>	<p>Adjacent land use (within ½ mile upstream, upslope, or radius)</p> <p><input checked="" type="checkbox"/> forested/natural vegetation <u>30</u> %</p> <p><input checked="" type="checkbox"/> agriculture, urban/suburban <u>65</u> %</p> <p><input checked="" type="checkbox"/> impervious service <u>5</u> %</p> <p>Dominant vegetation</p> <p>1) <u>Microstegium vimineum</u></p> <p>2) <u>Fraxinus pennsylvanica</u></p> <p>3) <u>Alnus serrulata</u></p> <p>Flooding and wetness</p> <p><input type="checkbox"/> semipermanently to permanently flooded or inundated</p> <p><input checked="" type="checkbox"/> seasonally flooded or inundated</p> <p><input type="checkbox"/> intermittently flooded or temporary surface water</p> <p><input type="checkbox"/> no evidence of flooding or surface water</p>
--	--

Wetland type (select one)

- | | |
|--|--|
| <input type="checkbox"/> Bottomland hardwood forest | <input type="checkbox"/> Pine savanna |
| <input checked="" type="checkbox"/> Headwater forest | <input type="checkbox"/> Freshwater marsh |
| <input type="checkbox"/> Swamp forest | <input type="checkbox"/> Bog/fen |
| <input type="checkbox"/> Wet flat | <input type="checkbox"/> Ephemeral wetland |
| <input type="checkbox"/> Pocosin | <input type="checkbox"/> Carolina Bay |
| <input type="checkbox"/> Bog forest | <input type="checkbox"/> Other _____ |

*The rating system cannot be applied to salt or brackish marshes or stream channels.

				weight			
R	Water Storage	<u>1</u>	x	4.00	=	<u>4</u>	
A	Bank/Shoreline stabilization	<u>1</u>	x	4.00	=	<u>4</u>	
T	Pollutant removal	<u>2</u>	x	5.00	=	<u>10</u>	
I	Wildlife habitat	<u>1</u>	x	2.00	=	<u>2</u>	
N	Aquatic life	<u>2</u>	x	4.00	=	<u>8</u>	
G	Recreation/Education	<u>1</u>	x	1.00	=	<u>1</u>	
Total Score¹						<u>29</u>	

¹Add 1 point if in sensitive watershed and >10% nonpoint disturbance within ½ mile radius.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/2/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WX-UP
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Roadside hillslope Local relief (concave, convex, none): None Slope (%): 2-4%
 Subregion (LRR or MLRA): LRR P Lat: 35.819174 Long: -78.822879 Datum: NAD83
 Soil Map Unit Name: WnA - Wehadkee silt loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

Data point WX-UP was taken on a roadside fillslope next to NC-54, 10 feet from wetland WX.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations:

Surface Water Present? Yes No Depth (inches):
 Water Table Present? Yes No Depth (inches): >24"
 Saturation Present? Yes No Depth (inches): >24"
 (includes capillary fringe)

Wetland Hydrology Present? Yes No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators observed.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WX-UP

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				
1. <u><i>Fraxinus pennsylvanica</i></u>	<u>40%</u>	<u>Y</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>80%</u> (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
<u>40%</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. <u><i>Cornus amomum</i></u>	<u>15%</u>	<u>Y</u>	<u>FACW</u>	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>15%</u> = Total Cover				
Herb Stratum (Plot size: <u>30'</u>)				
1. <u><i>Microstegium vimineum</i></u>	<u>60%</u>	<u>Y</u>	<u>FAC</u>	Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. <u><i>Festuca sp.</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>15%</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u><i>Lonicera japonica</i></u>	<u>5%</u>	<u>Y</u>	<u>FACU</u>	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>5%</u> = Total Cover				
				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: **WX-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2"	10YR 2/2	100%					Sandy loam	
2-10"	10YR 3/2	100%					Sandy loam	
10-14"	10YR 4/3	100%					Sandy loam	
14-24"	10YR 5/3	95%	10YR 3/6	5%	C	M	Sandy clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No hydric soil indicators present.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 8/2/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WX-WET
 Investigator(s): J. Hartshorn & W. Sullivan (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): <1%
 Subregion (LRR or MLRA): LRR P Lat: 35.819163 Long: -78.822918 Datum: NAD83
 Soil Map Unit Name: WnA - Wehadkee silt loam, 0 to 2 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

WX is a small depressional wetland bounded by NC-54 and railroad tracks. WX drains to an intermittent stream that flows to Crabtree Creek.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input checked="" type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>>20"</u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>Surface</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
--	--

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WX is supported by stormwater runoff and groundwater seepage. Standing water was not present at data point WX-WET, but was observed in other areas of WX.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WX-WET

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				
1. <u>Fraxinus pennsylvanica</u>	<u>30%</u>	<u>Y</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>9</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)
2. <u>Liquidambar styraciflua</u>	<u>15%</u>	<u>Y</u>	<u>FAC</u>	
3. <u>Acer rubrum</u>	<u>10%</u>	<u>N</u>	<u>FAC</u>	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
	<u>55%</u> = Total Cover			
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. <u>Alnus serrulata</u>	<u>25%</u>	<u>Y</u>	<u>OBL</u>	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
2. <u>Cornus amomum</u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Ulmus americana</u>	<u>10%</u>	<u>N</u>	<u>FACW</u>	
4. <u>Fraxinus pennsylvanica</u>	<u>5%</u>	<u>N</u>	<u>FACW</u>	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
	<u>60%</u> = Total Cover			
Herb Stratum (Plot size: <u>30'</u>)				
1. <u>Microstegium vimineum</u>	<u>35%</u>	<u>Y</u>	<u>FAC</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. <u>Boehmeria cylindrica</u>	<u>20%</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Polygonum sp.</u>	<u>15%</u>	<u>Y</u>	<u>FAC</u>	
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
	<u>70%</u> = Total Cover			
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u>Toxicodendron radicans</u>	<u>25%</u>	<u>Y</u>	<u>FAC</u>	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. <u>Smilax rotundifolia</u>	<u>25%</u>	<u>Y</u>	<u>FAC</u>	
3. _____				
4. _____				
5. _____				
6. _____				
	<u>50%</u> = Total Cover			
Remarks: (Include photo numbers here or on a separate sheet.) Buttressed trees were observed in wetland WX.				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

SOIL

Sampling Point: **WX-WET**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-14"	10YR 4/1	85%	7.5YR 4/6	15%	C	M	Loamy clay	
14-20"	N 4/	60%	7.5YR 5/8	40%	C	M	Loamy clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:
 No water table was observed at WX-WET, but surface saturation was present.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WZ-UP
 Investigator(s): R. Sullivan & J. Hartshorn (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Levee Local relief (concave, convex, none): None Slope (%): 0-1%
 Subregion (LRR or MLRA): LRR P Lat: 35.820818 Long: -78.828679 Datum: NAD83
 Soil Map Unit Name: Congaree silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks:

The upland data point was taken ~60' south of and 0.5' to 1' higher in elevation than the wetland data point. The upland data point was taken on a sanitary sewer utility easement.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>24"</u> Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>24"</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of wetland hydrology were observed at the upland data point location.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WZ-UP

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <i>Platanus occidentalis</i>	35%	Y	FACW	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>6</u> (A) Total Number of Dominant Species Across All Strata: <u>8</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>75%</u> (A/B)	
2. <i>Pinus taeda</i>	25%	Y	FAC		
3. <i>Betula nigra</i>	15%	Y	FACW		
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
	<u>75%</u> = Total Cover			Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)					
1. <i>Ligustrum sinense</i>	10%	Y	FACU		
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
	<u>10%</u> = Total Cover			Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: <u>15'</u>)					
1. <i>Sorghum halepense</i>	20%	Y	FACU		
2. <i>Microstegium vimineum</i>	20%	Y	FAC		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	<u>40%</u> = Total Cover			Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <i>Vitis rotundifolia</i>	10%	Y	FAC		
2. <i>Smilax rotundifolia</i>	10%	Y	FAC		
3. _____					
4. _____					
5. _____					
6. _____					
	<u>20%</u> = Total Cover			Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: **WZ-UP**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2"	5YR 4/4	100%					Sand	
2-14"	5YR 4/4	100%					Clay loam	
14-24"	5YR 4/3	95%	7.5YR 5/6	5%	C	M	Clay loam	
24-30"	7.5YR 6/3	95%	7.5YR 4/6	5%	C	M	Clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (**LRR N**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (**LRR N, MLRA 147, 148**)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (**MLRA 147, 148**)
- Thin Dark Surface (S9) (**MLRA 147, 148**)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
- Umbric Surface (F13) (**MLRA 136, 122**)
- Piedmont Floodplain Soils (F19) (**MLRA 148**)
- Red Parent Material (F21) (**MLRA 127, 147**)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (**MLRA 147**)
- Coast Prairie Redox (A16) (**MLRA 147, 148**)
- Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:
Depth (inches):

Hydric Soil Present? Yes No

Remarks:

No hydric soil indicators were observed at the upland data form location.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: TIP# U-5811 City/County: Wake County Sampling Date: 08/3/2016
 Applicant/Owner: NCDOT State: NC Sampling Point: WZ-WET
 Investigator(s): R. Sullivan & J. Hartshorn (Kimley-Horn) Section, Township, Range: Cedar Fork
 Landform (hillslope, terrace, etc.): Bottomland floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1%
 Subregion (LRR or MLRA): LRR P Lat: 35.820998 Long: -78.828638 Datum: NAD83
 Soil Map Unit Name: Congaree silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

Wetland WZ is a bottomland floodplain wetland that likely receives periodic flooding from stream SA (UT to Crabtree Creek). A sanitary sewer utility easement runs along SA.

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>1"-2"</u> Water Table Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>Surface</u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>Surface</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
---	--

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Pockets of standing water were observed throughout the wetland. The water table and soil saturation was observed at the soil surface.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WZ-WET

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>9</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)
1. <u><i>Acer rubrum</i></u>	<u>30%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Pinus taeda</i></u>	<u>25%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Salix nigra</i></u>	<u>20%</u>	<u>Y</u>	<u>OBL</u>	
4. <u><i>Carpinus caroliniana</i></u>	<u>20%</u>	<u>Y</u>	<u>FAC</u>	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
<u>95%</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = FACW species _____ x 2 = FAC species _____ x 3 = FACU species _____ x 4 = UPL species _____ x 5 = Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
1. <u><i>Liquidambar styraciflua</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Diospyros virginiana</i></u>	<u>10%</u>	<u>Y</u>	<u>FAC</u>	
3. <u><i>Acer rubrum</i></u>	<u>5%</u>	<u>N</u>	<u>FAC</u>	
4. <u><i>Morella cerifera</i></u>	<u>5%</u>	<u>N</u>	<u>FAC</u>	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>30%</u> = Total Cover				
Herb Stratum (Plot size: <u>15'</u>)				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. <u><i>Microstegium vimineum</i></u>	<u>50%</u>	<u>Y</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>50%</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
1. <u><i>Lonicera japonica</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
2. <u><i>Campsis radicans</i></u>	<u>5%</u>	<u>Y</u>	<u>FAC</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>10%</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: **WZ-WET**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Remarks
	Color (moist)	%	Color (moist)	%				
0-12"	7.5YR 4/2	90%	7.5YR 4/6	10%	C	M	Clay loam	
12-24"	7.5YR 6/2	80%	7.5YR 5/8	20%	C	M	Sandy clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) **(LRR N)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- Thin Dark Surface (S9) **(MLRA 147, 148)**
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- Umbric Surface (F13) **(MLRA 136, 122)**
- Piedmont Floodplain Soils (F19) **(MLRA 148)**
- Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) **(MLRA 147)**
- Coast Prairie Redox (A16) **(MLRA 147, 148)**
- Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

The soil was too saturated to auger below 24". Both the water table and soil saturation were observed at the surface.

Appendix D

Qualifications of Contributors

Investigator: Ross Sullivan
Education: B.S. Social Psychology, 2008, Masters of Natural Resources (MNR),
Assessment and Analysis Technical Option, 2014, Graduate Certificate
in Geographic Information Systems, 2014
Experience: Environmental Analyst, Kimley-Horn and Associates, Inc. 2014-Present
Responsibilities: Wetland and stream delineations, GPS/GIS, stream assessment,
natural community assessment, T/E species assessment, document
preparation

Investigator: William Sullivan
Education: B.S. Natural Resources – Ecosystem Assessment, 2016, Minor in Forest
Management, 2016
Experience: Environmental Intern, Kimley-Horn and Associates, Inc. 2016-Present
Responsibilities: Wetland and stream delineations, GPS/GIS, T/E species
assessment/survey, document preparation